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# THE YOUNG NATURALIST

BY THE SAME AUTHOR

ANIMALS AT HOME  
A YEAR WITH NATURE  
BRITISH BIRD-LIFE  
COUNTRY RAMBLES  
EVERY BOY'S BOOK OF BRITISH NATURAL  
HISTORY  
FIFTY-TWO NATURE RAMBLES  
THE ANIMALS AND THEIR STORY  
THE STORY OF INSECT LIFE  
THE STORY OF THE SEA AND SEASHORE  
THE BOY'S OWN NATURE BOOK  
THE INSECT BOOK

WITH C. S. COOPER

THE YOUNG BOTANIST





GREEN WOODPECKER

(*Gecinus viridis*)





# THE YOUNG NATURALIST

A GUIDE TO BRITISH ANIMAL LIFE.

BY  
W. PERCIVAL WESTELL  
F.L.S., M.B.O.U.

WITH EIGHT COLOURED PLATES BY  
C F NEWALL  
AND TWO HUNDRED AND FORTY PHOTOGRAPHIC ILLUSTRATIONS

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*First Published in 1909*

TO  
THE YOUNG NATURALISTS  
OF  
GREAT BRITAIN AND HER COLONIES



## PREFACE

IN view of the extended Introduction to this volume, in which its salient features are recorded, it is unnecessary for anything to be said here excepting chiefly by way of acknowledgment. For many valuable notes on various subjects connected with British Animal Life I am greatly indebted to Mr. James Aird, of Girvan, Mr. C. H. Slaytor, of Doncaster, and Mr. Alfonzo Gardiner.

To Messrs. E. J. Arnold and Sons, of Leeds, I am under an obligation for the readiness with which they permitted me to make use of the information contained in their admirable little life-histories of animals (written by Mr. Alfonzo Gardiner), and I have largely consulted the following works, the usefulness and value of which I freely acknowledge: Mr. W. F. Kirby's "Butterflies and Moths of Europe," Mr. R. Lydekker's "Mammals," Mr. F. G. Aflalo's "Natural History (Vertebrates) of the British Islands," Mr. R. South's "The Butterflies of the British Isles," the writings of the late Mr. Saville Kent and others in "The Living Animals of the World," Dr. Gerald Leighton's "British Snakes" and "British Lizards," Professor Ainsworth Davis's "Natural History of Animals," and Sir Ray Lankester's "Extinct Animals."

The compilation of this book has of necessity entailed a great amount of research and practical field-study, and it has taxed my powers of discrimination to the utmost as to what forms of life to eliminate in certain voluminous sections. The number of inquiries I have received, however, from ardent young naturalists and teachers, in addition to other Nature lovers, from all parts of the country, for a fairly comprehensive intro-

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# THE YOUNG NATURALIST

## CHAPTER I

### GENERAL INTRODUCTION

Foreword—Biology, Zoology, and Botany—Botany and Entomology—Commoner Forms of Wild Life—The Objects of this Book—Value of Common Things—Knowing an Animal or Plant—Great Naturalists and their Work—Value and Delights of Nature-Study—Little Things—Make a Good Start—Eyes and No Eyes—A Love for Nature—Nature-Study and Education—A Scheme of Nature-Study for School Work—Need for Field Work—A Nature Notebook—Notes on Frog-Spawn and Tadpoles—Field-Glass, Pocket-Lens, Microscope, and Camera—What to Wear when Naturalising—Observing Nature when Cycling—Extracts from an Old Book on Animals—Bird Migration—Distribution and Movements of Animals—Clothing of Animals—Protective Coloration—Other Designs for Protective Purposes—Animal Homesteads—Reproductive Powers—Devotion of Animals towards their Offspring—Language of Animals—Courtship and Pairing Days—Feeding Habits—Uses of Animals—Animal Products—Locomotive Power of Animals—Solitary and Social Habits—Hardiness, Tenacity, and Age of Animals—Ignorance and Superstition—Wonders Revealed by the Microscope—Extinction and Decrease of Animals, and the Reasons—The so-called "Fairy-Tales" of Science—Classification of Animals from Aristotle to To-day—Vertebrate Classification—Invertebrate Classification—Conclusion.

**F**OREWORD.—In this opening chapter it will be as well for us to consider a number of interesting points which may here be accorded a place. By this means sentiment and moralising may be entirely eliminated from the biographies of the various kinds of animals with which we are concerned, and when we come to consider them individually we shall be better able to make them interesting and human. Whilst we shall in duty bound, feel it incumbent upon us to point out in the life-

histories of many wild creatures the good they perform and the protection they need, we shall endeavour to characterise our work by rigidly keeping to our idea of making the same interesting, useful, and anecdotal, rather than a prosy, philosophical, sentimental, moralising book—excellent reading, perhaps, and full of pretty pictures, but of little use to those interested in British wild life. It is our aim that this book shall be essentially an interesting and a useful one. By its aid it is hoped and believed that the young inquirer will be enabled to gain a certain amount of information concerning any of the commoner animals upon the British list, and it is our fervent hope that the manner in which we handle our subject will be sufficiently attractive to encourage the young student to add to his store of knowledge by pursuing the life-study of the animal he has in view on his own account.

**Biology, Zoology, and Botany.**—First, let me tell you that our book deals with that branch of Natural Science called Zoology, which covers a large field, and may be split up into various sections, such as Morphology, dealing with form and structure; Comparative Anatomy, which compares the structure of organs in different animals; Embryology, which deals with development from the ovum to maturity; Physiology, which treats of the functions of all organs; Classification or Taxonomy, which classifies animals into groups; and other branches, such as Distribution, Utility, etc., which need not be detailed. Biology, the science of life (derived from the Greek *bios*, life; *logos*, a discourse), deals with living matter, and this Science of Biology is conveniently subdivided into two main branches, known as Zoology and Botany, the one treating of animals and the other of plants. The words are derived from the Greek *zōon*, an animal, and *botanē*, a plant. Whilst many naturalists are of opinion that no hard-and-fast rule can be laid down in the case of some of the lower orders of animals coming under the Zoological section (especially those of a microscopical character), and some of the vegetable growths coming under the Botanical department, it is sufficient for our present purpose to generalise in this way. Under the head of Zoology, then, come living

animals, and if we take those represented on the British list only they embrace the five classes of back-boned animals, Mammals, Birds, Reptiles, Amphibians and Fishes, also the Crabs, Scorpions, Insects, etc., concluding with the lower forms of animal life, such as Shellfish, Starfishes, Jellyfishes, and so on.

**Botany and Entomology.**—These, then, are the various departments of Zoology with which we shall concern ourselves, and, although Botany will be eliminated, mention will be made (more especially in Chapter VII., devoted to Insects) of the close connection which exists between animal and plant life. I commend to your notice the fascinating study of Botany, because I have long since come to regard this branch of Natural History as most delightful and wonderful. And not only this: a knowledge of our Flora helps one in various ways to interpret and understand the true life-histories of many kinds of insects, their economic value, and indeed, in some instances, indispensable aid, and to my mind the two subjects of Botany and Entomology are almost, if not quite, inseparable.

**Commoner Forms of Wild Life.**—Our volume is devoted to the commoner forms of British wild life, but we should qualify the statement. The sea, with its unlimited wonders, is almost excluded from our story. We shall, however, consider the biographies of a number of animals who inhabit the sea and seashore, but entirely eliminate sea-fish. To include within the compass of one volume even a tithe of the denizens of the vasty deep would be impossible. Then, again, we have, as stated, eliminated Botany from our book for similar reasons, and we have not thought fit to include the rarer forms of British wild life, but rather to devote our sole attention to fairly general accounts of our commoner British animals.

**The Objects of this Book.**—Our book does not consist of a cosmopolitan collection of stories of monsters who never existed, or of fairy-tales and silly superstitions and fallacies, which might please our little children, but not a growing and intelligent youth possessing the seeing eye and the receptive ear; and above and beyond all, it is our earnest wish to treat of this subject as one of the open air rather than of the museum,

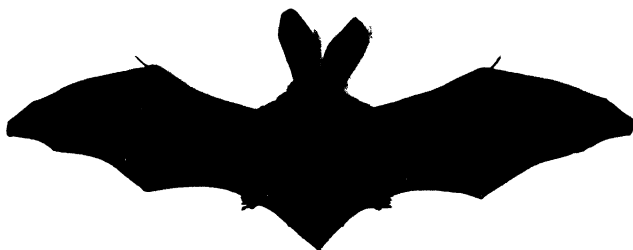
of Natural History in the field rather than in the classroom or the laboratory. The day for dry-as-dust books has passed, and whilst we are the first to admit that County and National Collections of animals and plants are valuable, helpful, attractive, and educational, and we are wishful to acknowledge the splendid work accomplished by legitimate and discriminate Collectors, Scientists, and our learned Societies, it is the wild life of the fields, the ponds and rivers, the seashore, the woods and lanes, upon which we are desirous of concentrating our attention, and the study of which we are so desirous of encouraging. Those species of animals that are most likely to come under the notice of young people will be dealt with, and I would point out here the mistaken idea that prevails as to common things.

**Value of Common Things.**—When commencing the delightful occupation of taking notice of outdoor life, one need not wander far afield in search of rarities. I have heard my friend Lord Avebury (to whom we owe so much) discourse with the utmost enthusiasm how he has burned the midnight oil (or rather an Argon lamp) for the purpose of keeping a Dandelion awake at night, or how interested he was in ascertaining the seed-dispersal powers of a common wayside plant known as Herb Robert. Take the commonest wild animal, tree, or plant: how many of us are there who know one single individual intimately and accurately and fully? The little Daisy, who lifts its head proudly above the earth to receive the life-giving warmth from the sun, has as wonderful a life-story to unfold as the most costly orchid ever grown.

**Knowing an Animal or Plant.**—Sir Joseph Hooker—the eminent botanist who not long since celebrated his sixty-fifth year of Fellowship of the Linnæan Society—was once asked the question how many plants he knew intimately. He answered with truthfulness that he did not know the full life-history of any one plant, for the particular flower he happened to be studying was so wonderful and its biography so absorbing, that the study of that one individual drove the knowledge he possessed of all others out of his head. It is one thing to be able to identify a wild animal or plant and another thing to know



LONG-EARED BAT ASLEEP



LONG-EARED BAT, SHOWING LONG EARS, WINGS, ETC.



SKELETON OF BAT



PLATE II



COMMON SEAL



COMMON OTTER

it—to be able to unfold correctly its hidden meaning, to interpret with certainty its place in the economy of Nature, to study with intelligence its form, structure, and habitat, and to be able to ascertain how it lives and where, and to appreciate to the full its whole life-history.

**Great Naturalists and their Work.**—The young naturalist would do well to follow the examples of the great men who have gone before, the painstaking labours of those still happily left among us. I commend the lives of Aristotle, Pliny, Ray, Buffon, Cuvier, the great Linnæus—to whose system of classification we owe a debt of gratitude we can never hope to repay, as we shall show hereafter—Haeckel, Huxley, Darwin, Lyall, Hooker, Gesner, Wallace, Buckland, Waterton, Gilbert White, and others, to the notice of all those aspiring to become systematic, methodical, truthful, persevering, enthusiastic, and ambitious. If a subject is worth pursuing (and this applies with emphasis to Natural History) it is worth doing well, and the young reader who has never read “The Natural History of Selborne,” by the Rev. Gilbert White, would do well to make himself the happy possessor of a copy of that delightful classic. This book—with which the charming Hampshire village of Selborne will always be associated—shows what an intimate knowledge of the lives and habits of wild creatures may be obtained by a single individual in a restricted district. We cannot all hope to become great naturalists, intrepid explorers, or philosophers; but the merest tyro among us can be of some service in helping to unravel some hidden Nature secret, in doing his or her part to supply a link to a hitherto broken chain of much importance. One must, however, have that great incentive to successful study, observation, and research—enthusiasm, and a natural love for the harmless pursuit of interpreting correctly the lives and habits of wild folk.

**Value and Delights of Nature-Study.**—Although it may not benefit us—other than making us more fit in these days of rush and tear, mentally and physically—many of us have come to recognise that the delightful occupation of studying some of the wonders of Nature makes us better able to carry out our duties in life; it gives us more interest in the world

around us, and helps us to arrive at a better understanding as to the wonderful secrets which Dame Nature has to reveal to us through the agency of her countless children. ●

Let no young man be discouraged because hitherto he has not paid attention to wild Nature's ways. In spite of the enormous number of books that have been written and the great and growing interest taken in the subject to-day, much remains to be accomplished. We do not all see, or think, or reason alike, and it is a very good thing we do not. What strikes one does not strike another. Go out into your favourite greenwood with a companion, and if your experience be similar to mine, you will find that what engages his attention is different to that which occupies your own. He will see things from a different standpoint. By suggesting and communicating his thoughts to you, and *vice versa*, you may between you help to solve together some problem of great interest.

**Little Things.**—It is the little things that count. The tallest Oak in the woodland came from a tiny acorn such as you crush underfoot. Once it was no larger than the tiny Oak sapling a few inches only in height, but as the years rolled by the little tree gathered strength year by year, until eventually it attained the huge growth of the forest giant. There was no hurry, however. It was all done silently, steadfastly, and systematically—no bustle, no excitement. Careful and methodical work always pays. Make a small beginning. Do your work well and carefully. Imbue within you a love and enthusiasm for your subject; be energetic and painstaking. Walk lovingly and trustfully with Dame Nature, and rest assured that in time you will achieve success even in a humble way, and be thankful a thousand times when you first learned to pay intelligent heed to the keen delights of outdoor life.

**Make a Good Start.**—It is as important in Nature-Study as in everything else to make a good start, to lay a good and sure foundation. As the racer gets off the mark sharp to time, as the cricketer plays his first ball plump in the middle of the bat (and what a lot that first ball means!), as the oarsman plunges his oar well and deftly when the pistol-shot is fired, so

it is with the study of Nature, or any other hobby, recreation, sport, or business. It resolves itself to a great extent upon your own individual efforts as to whether success comes your way.

**Eyes and No Eyes.**—It is all a question of eyes and no eyes in Nature. I have had companions with me on my country wanderings who have failed to see, or hear, or interpret the sights and sounds around them. They possessed not that very necessary qualification for success in studying Nature's children—namely, the power of observation. To be observant is in all walks of life a fine and necessary adjunct to success, but especially so in the study of Natural History. Observation quickens the senses; it brightens and smartens us up as it were, and many a dullard has, by devoting his attention to the wild life of the fields and lanes, become in after-life a better and a brighter man. Many pages in Nature's book are as yet unopened, and the more we learn about her the more there is to learn. One point suggests another, and so the snowball grows until those of us who have studied Nature in her own wild fastnesses have to regard her as illimitable in the richness of her treasury, of wonders untold and undreamt of waiting at our very feet.

**A Love for Nature.**—Another phase of this subject that suggests itself to me as I write, and which I wish to emphasise is, that as you come to read the biographies of wild creatures from Nature's ever-open book, you will possess a desire to know and love them rather than to hunt and kill them. It is not our intention to introduce, even in our opening chapter, any rabid sentimentalism. We do not for one moment despise the true and legitimate sportsman, scientist, or discriminate collector; but we do say that by a careful, and lovable, and intelligent study of Nature's children in the open country you will come to regard them from a different standpoint altogether. Whilst most people, for example, hate the Wasp (and I myself would not go to the same length as some entomologists and permit one to settle on the tip of my nose), how few there are who are at all acquainted with the wonderful life-history of this insect—its untiring energy, its industry, its devotion,

and last, but by no means least, its economic value to you and me!

**Nature-Study and Education.**—Children are at all times most interested in anything pertaining to Natural History, provided the information is imparted to them in a popular way, so that they can adequately grasp what they are being told or what they are reading about. The education of the children has during the last year or two resulted in much conflict amongst educationalists, directly due to the much-maligned Education Act; but it is pleasant to reflect upon the fact that all seem agreed—Passive Resisters and others—that Nature-Study demands, and shall receive, a prominent place in the future curriculum.

It has long been accorded a place in many schools, but has been applied in the wrong way. The subject has been too long regarded as a dry-as-dust one. Practical Nature-Study is now being introduced with great success. Many schools have their laboratories, their botanical garden, their field rambles, their lessons in the open air. Systematic Nature Notebooks are kept by the youngsters; much encouragement is given them by their teachers to record even the most trifling episode in Nature's year, and it is encouraging to those intimately acquainted with twentieth-century Nature-Study in schools to note the intense eagerness with which the boys and girls seek to make entries in their Nature Notebooks and to learn something of the tenants of the countryside.

The collections of dull, inanimate objects are not so much sought after nowadays as original and first-hand observations of the living plant, insect, bird, mammal, fish, and other interesting creatures in the realm of Nature. This augurs well for the future. In a hundred years' time—perhaps far less—wild life will, we think, be regarded from a different standpoint to what it is to-day. The usefulness and economic value of birds, of various species of mammals and insects, etc., will be far better known in the next decade.

**A Scheme of Nature-Study for School Work.**—It is pleasing to note thus early the distinct advance that is being made, and I make no apology for setting out the follow-

ing practical little scheme, as I believe it will be of interest and use to teachers and others engaged in Nature-Study work.

I recently had the pleasure of visiting St. Mark's School, New Barnet, where, under the guidance of the master, Mr. G. A. Laking, I was shown various examples of the practical system of Nature-Study work there carried out. I was much struck with the original and practical form of Mr. Laking's Nature-Study curriculum, and the splendid work accomplished by his scholars; and, at my request, he has been good enough to send me a series of notes which I think will be of great use and interest to those readers engaged in similar work. Mr. Laking states that the scheme he follows out is essentially practical and the outcome of several years' experience as to the best means to employ.

The scheme is designed so as to awaken an active interest in natural objects, and sympathy with, and love for, living creatures—those lying nearest at hand and the easiest to procure being dealt with for preference.

For this subject the children are divided into upper and lower divisions.

The upper division syllabus is characterised by its elasticity. The teacher is free to deal with the subject uppermost in the minds of the children at the time, depending on the objects available, or the questions needing investigation—discussion of the notes made in the diaries, etc.

The syllabus for the lower division is more restricted. Each month has allotted to it an observation lesson—Sprig of Holly in January; Nature-Study (Berries as Winter Food for Birds); Practical Lesson with Notes (Feeding Birds in Winter); and Elementary Science (Frost and Snow).

Freedom is assured by providing observation lessons on a flower, birds' nests, etc., using general terms.

Occasional rambles are arranged, the districts chosen being extensive woods and country lanes and fields within easy reach of the school.

The children are encouraged to bring *common* objects to school for study, preservation, and exhibition.

The master arranges experiments to illustrate some branch of Nature-Study.

Among the many objects displayed and experiments carried out are :

1. Germination of seeds, root, stem, root-hairs, seed-leaves, and store of plant food. *Experiments*.—(a) Cress grown on stocking-web stretched over an ordinary jam jar. (b) Beans and peas. (c) Acorn and chestnut.

2. *Care of Plants*.—Wild flowers are potted and placed in window recesses, and the children are duly deputed and encouraged to care for them.

3. *Birds*.—Their nests and eggs. A small collection of the eggs of *commoner* birds is formed, and *old* nests to show structure and materials.

4. *Insects*.—Small collection of *common* moths, butterflies, beetles, bees, etc.

Breeding caterpillars, preserving the chrysalides in sawdust, and noting the emergence of the imago or perfect insect, finally preserving and mounting slough, chrysalis case, perfect insect, and plant food.

5. *Pond Life*.—As the season advances there are displayed in large jam-jars, or other convenient vessels, such objects as frogs' spawn, water-snails, beetles and other insects, sticklebacks and newts, all of which are easily procured and interest the children greatly.

6. *Wild Flowers*.—Specimens of common plants are gathered (not huge bunches), and displayed in bottles of water. These are duly named and characteristics noted. Others are preserved, and dried and mounted for closer study in Winter.

Mounted specimens, collected in former years, are displayed at the time their flowering period comes round.

7. The children are encouraged to take any object, say a fir-cone, dissect it, mount the parts, and write original notes about it.

The teacher carefully preserves the written notes of all the subjects dealt with for future reference and for the guidance of the Inspector.

I trust this concise but most excellent syllabus will afford interest to those of my readers engaged in teaching the young folks to love and care for some of the wonders of Nature, and I take this opportunity of commending the splendid work which Mr. Laking is accomplishing among the girls and boys of St. Mark's School.

I would at the same time emphasise the uselessness of picking large bunches of flowers, rooting up plants indiscriminately, or making large collections of birds' eggs or insects. If a small collection of any objects is necessary for study a few specimens of representative or typical species will suffice, and I should hesitate to recommend the making of any collections which would unduly rob the countryside of its treasures or involve waste in any shape or form.



**Need for Field Work.**—There is a great need for more systematic *field work* in Natural History, or Nature-Study, or whatever other name one cares to call it. It is most essential that young people should be encouraged in every possible way to pursue a pleasant and profitable hobby, and occasional outings and rambles as outlined in the brief synopsis just set out are eagerly looked forward to by the young folks. Natural History Societies, or at least many, if not most, of the members thereof, fail to accomplish good practical work *in the fields*. I am bound to admit that in the case of several Societies known to me there is too much of the tea-party element about the rambles and outings undertaken—a conspicuous lack of enterprise and of a desire to perform some good, solid work.

**A Nature Notebook.**—First and foremost, it should be stated with emphasis, the regular and systematic keeping of a Nature Diary or Notebook is most essential and necessary. A note made at the time, although perhaps of no importance, may eventually prove of the greatest usefulness and interest; and when one has accumulated a large number of records and observations over a series of years, it is remarkable to notice how often one has occasion to make reference to the same, and how distinctly useful it is by this means to make comparisons with the Notes of other Naturalists in different districts. As an instance of my meaning, let me quote briefly a few notes




taken from my own Diary during the Spring of 1907 concerning some Frog-Spawn I collected for the purpose of watching the most interesting and wonderful metamorphosis of this most useful Amphibian. They read as under :

**Notes on Frog-Spawn and Tadpoles.**—“*March* 30.—Frog-Spawn collected from a weedy pond at Cheshunt, where the Frogs were congregated together for breeding purposes.

*April* 4.—Having placed the spawn in water on the first-mentioned date, I observed to-day that the symmetrical shape of the spawn was already disappearing. The little black or dark brown eggs situated in the centre of the greenish or whitish jelly are certainly hatching, having assumed this shape this morning , instead of . The eggs now appear like little beans.

*April* 6.—The bulldog-like head of the tadpole observable.

*April* 7.—Tadpoles still embedded in jelly, but the spherical form of the whole egg has now disappeared. The little creatures are now this shape , the tail being curved well round.

*April* 9.—One or two of the tadpoles left jelly for first time.

*April* 10.—All the tadpoles left centre of egg matter and were seen to-day hanging tail downwards underneath the mass of jelly. The gills are plainly to be seen, and the first movement was exhibited ; when the bottle was tapped the tails of two of the interesting little creatures were rapidly curled round. Why is this? What is the object of so doing? The tadpoles are now very leech-like and flabby.

*April* 11.—Tadpoles very lively, wriggling viciously to free themselves from the jelly. They are very fond of turning their tails round their bodies. Several little bristles to be seen near the gill-covers, which seem to give the tadpoles a hold upon the jelly-like substance still floating on surface of water. Those tadpoles that are free lay at the bottom of receptacle with gill-slits wide open.

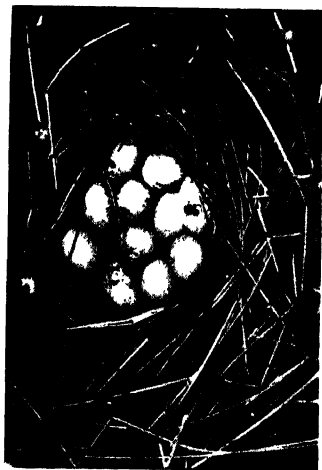
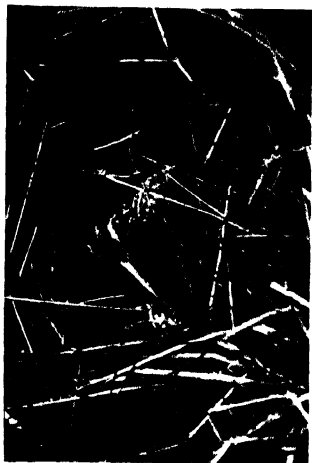
*April* 15.—All the tadpoles have left the mass of jelly, which floats at surface, a dishevelled-looking object, its work accomplished. They are all at the bottom of the bottle, and are very lively.



FEMALE ALIGHTING ON EGGS  
STUDIES OF THE LESSER TERN



FEMALE ON NEST, FRONT VIEW.



NEST AND EGGS OF SHOVELLER DUCK



WOODCOCK ON NEST



NEST AND EGGS OF WOODCOCK

*April 16.*—Tadpoles livelier, and the bulldog-like head rapidly showing more prominent.

*April 17.*—Tadpoles very lively still. Heads larger, and belly forming rapidly.

*April 20.*—Head and belly more prominent, and hind legs appearing. The tadpoles are now strong and expert swimmers.

*April 23.*—Tadpoles growing rapidly, and swim with greater facility and ease. When taken out of their element they collapse into a state of sheer helplessness, but on being placed in the water again become as frolicsome as ever.

*April 27.*—The tadpoles have much larger heads and bodies, but do not seem so graceful in their movements. They are more top-heavy, as it were."

And so we continue until we come to May 24, when our entry reads :

"Tadpoles much larger ; eyes quite prominent, and also the little sucking mouth. They have a brownish tinge about them now. Hind-legs to be plainly seen ; tail disappearing.

*May 31.*—Eyes of tadpoles much more prominent. They are light hazel-brown, with black centres. There is a noticeable swelling in the bodies ; the tails (or what is left of them) are spotted, and bodies much lighter in colour. The tadpoles have a decided preference to hide themselves more than they have done previously."

Many details have of necessity had to be omitted from our brief survey of the early life of a Frog when in the tadpole stage of its existence, and we are unable to follow its wonderful transformation right through. Sufficient has been written, however, to show what an interesting series of notes may be made, even although the subject studied be merely a handful of common Frog-Spawn collected in Spring-time. It is plainly evident that the full and accurate life-histories of even a few of our commonest animals and plants are far more valuable and interesting than a whole regiment of isolated facts, and I hope the few notes given concerning the vastly interesting development of one of our commonest animals will encourage our young people to take up for themselves such a harmless but pleasant occupation. The date, locality, soil, direction

of wind, situation, and other details, should all be carefully recorded.

**Field-Glass, Pocket-Lens, Microscope, and Camera.**

—Besides a notebook, the young naturalist should possess a field-glass which gives good definition and brilliant illumination, and in this connection I have found prismatic glasses to give much better results than the ordinary glass known to most people. By means of good reliable field-glasses small birds, almost unobservable to the naked eye, may be watched at practically close quarters, and without in any way disturbing the birds. In this way, one gets an intimate insight into home life in Birdland, and a whole series of interesting and useful data may be obtained. A small pocket-lens or magnifying-glass carried in the pocket is a most useful adjunct to Nature-Study—especially if Botany or Entomology be followed—whilst, if a high-power microscope can be purchased and kept in a safe place at home, many wonders of Nature will be revealed, often of absorbing interest and unmarketable beauty. The place now occupied by the camera in field natural history is too well known to be detailed. Through its agency many disputed points and theories have already been satisfactorily explained, and one has only to mention the remarkable series of Cuckoo photographs taken by Mr. J. Peat Millar, of Beith, which I had the honour of exhibiting before the Royal Society in 1905, in support of this statement. Snapshots of birds upon the wing have resulted in much information being elicited as to their modes of flight; and when we come to consider the marvellous micro-photographs which have been taken, enabling us to see in a highly magnified form tiny atoms of life, quite unobservable to the naked eye, enough has been stated to show what a valuable asset a camera has been, and still is, in helping us to unravel some of Nature's secrets.

**What to Wear when Naturalising.**—I have frequently observed people studying birds and other wild creatures dressed in a sufficiently alluring garb to frighten every animal into the next county, and I would strongly impress upon all young naturalists the desirability of wearing old, time-worn clothes when pursuing their country expeditions. An old suit or

overcoat, green or discoloured with age, is a first-class dress for a successful animal-stalker, whilst good watertight boots, a soft collar, and a waterproof satchel are useful, and, indeed, necessary for convenience and comfort.

**Observing Nature when Cycling.**—Walking is undoubtedly the keenest and most enjoyable means whereby one may carry out field studies successfully, but the use of a cycle is of distinct service as a means of quick locomotion from one place to another. There are cyclists *and* cyclists. Personally, I always prefer to pedal along quietly, holding the body in as erect a position as possible, and certainly not resorting to the extraordinary and ridiculous cramped positions some denizens of the road adopt.

As showing how quite unconsciously one may become on too intimate terms of acquaintance with animals when cycling in the country, I may perhaps be allowed to relate the following incident: A party of motor cyclists were returning from a ride, and the leader—when nearing the outskirts of the City of St. Albans—ran into a large Hare which happened to be crossing the road. The sudden impact resulted in the Hare being killed instantaneously, and the motorist experiencing a terrible fall.

When cycling, it is really wonderful how close the rider can get to mammals and birds. I myself have frequently almost run over Stoats and Rats, and many times birds dusting themselves along country lanes have only just been steered clear of. It is interesting to observe, too, how hedgerow-loving birds, such as Greater Whitethroats, Hedge Sparrows, Chaffinches, Greenfinches, and especially Yellow Buntings, may be noticed when one is enjoying a cycle ride in the country. For some distance one or more of these birds will fly in front of the rider, until eventually the latter passes his feathered companion. Many of our best sights of hedgerow birds have been obtained when cycling, and we remember especially a Cuckoo, which was perched on the topmost branch of a low hedgerow. So close were we to the bird that had we dared to release hold of our machines, we could have touched the pleasing harbinger of Summer.

We have pleasant recollections, too, of the flocks of Golden Plover and Lapwings which—when cycling during the Winter months—we have espied over the hedge in a neighbouring field. Had we been walking along the lane skirting the field we should not have noticed the presence of the birds, our exalted position upon the saddle thus enabling us to carry out a series of interesting observations. The flight of birds, too, may be observed to considerable advantage when cycling, and many useful notes may be made as a result.

Wild Flowers may often be noticed growing on a bank the opposite side of a hedgerow to where the lane or footpath is if one uses his eyes properly, and several species have been added to our list in this way.

So many people cycle nowadays for the mere pleasure of cycling that it is a wonder more do not pay regard to the floral and animal treasures of the countryside. Much as we revel in rambles across fields, by some enchanted river, or through a favourite copse, we recognise the great usefulness of a bicycle to the Field Naturalist—not only as a means of locomotion, but also as regards the store of notes which are directly due to being mounted upon a trusty steed.

The Hare incident above related reminds us of a very curious occurrence which happened to a friend a Summer or two ago. He was cycling through a charming bit of Hertfordshire woodland scenery, and travelling at a fair pace. From the hedgerow a small bird flew out, alighted on one of the spokes of the back wheel of the cycle, and was carried round on the wheel for a distance of several yards. Our friend—on having his attention called to the extraordinary tenant upon his back wheel—dismounted, and the bird sat complacently upon the spoke where it had first alighted, not one whit the worse for its curious adventure. It proved, on examination, to be a young Greater Whitethroat, and as the author was an eyewitness of this incident he can vouch for its accuracy.

**Extracts from an Old Book on Animals.**—I have recently been perusing a book on “Animal Biography” published nearly one hundred years ago, and many things in it cannot fail to interest and amuse animal lovers of to-day.

The Porpoise, for instance, is written of as the Porpesse, the Sea Hog, and the Porpesse Pig, whilst in writing of the well-known Secretary Bird of Africa the author refers to "*the Hottentots* at the Cape of Good Hope" distinguishing this bird by a name that signifies the Serpent Eater, and "the Dutch gave it the name of Secretary, on account of the bunch of quills behind its head; for in Holland, clerks, when interrupted in their writing, stick their pens in their hair behind their right ear; and to this the tuft of the bird was thought to bear some resemblance."

Regarding the Golden Eagle, several interesting points are raised. Instances are recorded of these birds carrying off young children in their talons, and of even on one occasion killing an adult. This happened—so the author, the Rev. W. Bingley, A.M., F.L.S., tells us—in Ireland. The nest was built on a small island "in the beautiful lake of Killarney." A peasant, it appears, resolved to rob the nest. He stripped himself for the purpose of swimming across to the island. On arrival, the parent birds were found to be away from the nest; but when swimming back, the parents, having returned and observed what had happened, quickly swooped down on the plunderer, "killed him on the spot, and rescued their young."

Quotes Mr. Bingley:

"Thus the bold bird her helpless young attends,  
From danger guards them, and from want defends;  
In search of prey she wings the spacious air,  
And with the untasted food supplies her care."

Of the long life which birds of the Eagle kind live, our author relates an instance of a Golden Eagle that died at Vienna after being in confinement over one hundred years, and one that was in possession of "a gentleman of Conway, in Caernarvonshire" (the latter spelt with two e's, you will observe) which, through neglect on the part of his servants, lived for three whole weeks without any sustenance whatever! An error was made by the author in his statement that the Osprey "usually builds its nest on the ground, among reeds," for the nest of this splendid British species is generally placed



in a tree on some island lake, or in a wood. It does not either "lay three or four white eggs," these being yellowish-white, irregularly spotted with yellowish-brown.

It is sad to reflect upon the fact that it is only about one hundred years ago when there were few birds of the Hawk species more common in this country than the Buzzard. Nowadays it is a comparatively rare bird, although in some few districts (in Wales, for example) several birds may be seen on a day's ramble.

It is pleasant to see a place accorded in the work under notice to the Chanting, or Chaunting, Hawk, which species, unlike all other birds of prey, utters a song. It is the sole minstrel of its race, and during the breeding season the male "of this lately discovered species" (as our author, writing about a century ago, calls it) is remarkable for its song. This it utters every morning and evening, and, like the Nightingale, not uncommonly all the night through. It sings out in a loud tone for more than a minute, and after an interval begins anew. During its song it is so regardless of its own safety that anyone may approach very near to it; but at other times it is very suspicious, and takes flight on the slightest alarm. This is not a British bird, being a South African species known to the Dutch as Blaauwe Valk (Blue Hawk).

I notice that "Mr. White, of Selborne," is largely quoted in the interesting old book before me. This, of course, refers to the Rev. Gilbert White, whose classic, "The Natural History of Selborne," is known to every country lover, and, as the celebrated Selborne naturalist died in 1793, this book was written within a very few years after his death. In writing of the Adder, for instance, our author quotes White's observations, made on August 4, 1775, respecting the female Viper he and a friend found, "which seemed very heavy and bloated as it lay in the grass basking in the sun." The Snake was killed, and in the abdomen fifteen young ones were found. White writes:

"This little fry issued into the world with the true Viper-spirit about them, showing great alertness as soon as disengaged from the belly of the dam; they twisted and wriggled

about, set themselves up, and gaped very wide when touched with a stick, showing manifest tokens of menace and defiance, though as yet they had no manner of fangs that we could find, even with the help of our glasses."

I have made this quotation from my own copy of the classical book, and notice that Mr. Bingley writes almost the same, word for word, without acknowledging White's authorship. I eagerly devoured the essay on the Adder, in the hope that something would be stated on the vexed subject of the female—or dam, as our author calls her—swallowing her young in the time of danger, but not a word is mentioned.

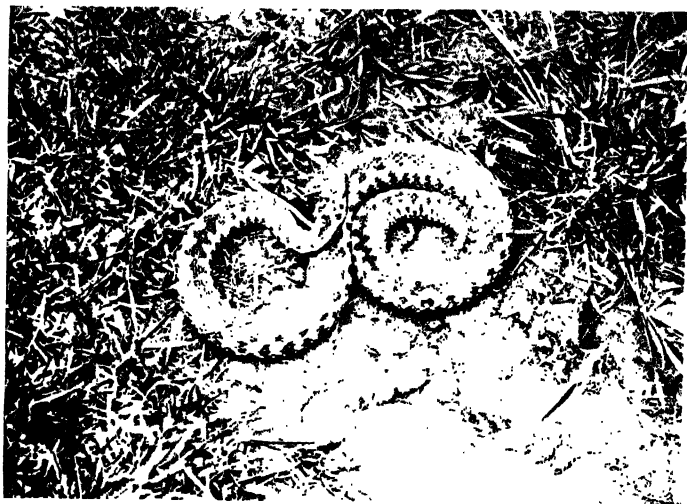
A most interesting incident is recorded in regard to the poison of this Snake. We are told that, "in the presence of the Grand Duke of Tuscany, while the philosophers were making elaborate dissertations on the dangers of the poison taken inwardly, a viper-catcher, who happened to be present, requested that a quantity of it might be put into a vessel, and then, with the utmost confidence, and to the astonishment of the whole company, drank it off in their presence. Everyone expected the man instantly to drop down dead; but they soon perceived their mistake, says the relater of the story, and found that, taken inwardly, the poison was as harmless as water."

It is curious to read of the "dam" (the female bird) of the Swallow and the Martin, and of the vibration of the wings of the former acting on the confined air within a chimney "like the rumbling noise made by distant thunder." The migration of these birds is alluded to, and, of course, the theory as to these and other Summer migrants not leaving this country, "but that they lie concealed, and in a torpid state, during Winter, under water," is referred to, and the Hon. Daines Barrington (White's great friend) is quoted as an authority having this opinion. Our author, however, goes on to state that "it is highly absurd to suppose that any of them could remain for a long time under water," and that "the actual migration of the Swallow tribe does take place has been fully proved from a variety of well-attested facts; most of which have been taken from the observations of navigators who were

eyewitnesses of their flights, and whose ships have sometimes afforded to them resting-places in their toilsome journeys."

A most interesting series of incidents is recorded of a pair of Swallows who built their nest on the handles of some garden shears, which were placed against the boards in an out-house. Another pair built their homestead on the wings and body of an Owl which hung dead and dry from the rafter of a barn, so loose as to be moved by every gust of wind. The Owl's body was detached, with the nest, and presented to the museum of Sir Ashton Lever. The latter thereupon gave the person who brought this strange nest to him a large shell, desiring him to fix it up just where the Owl had hung. The man did so, and in the following year a pair of Swallows built their nest in the shell and laid eggs. Probably they were the same pair of birds who had built in the Owl's carcass. The Swift is in this book also called the Black Martin, and is classified (of course wrongly, as we now know) among the *Hirundines*. It is referred to as a bird which "passes more of its time on the wing *than any other Swallow*." The Caddis Fly is written of as the Cadew Fly, and an interesting incident is set out of a pair of Swifts which were found in February, 1766, in a torpid state under the roof of Longnor Chapel, in Shropshire. "On being brought to the fire they revived, and moved about the room." We might dip much more deeply into this most interesting old volume, but must close with an incident respecting our perennial feathered friend, the Cuckoo. Writing early in 1800, our author states that "a few years ago a young Cuckoo was found in a torpid state in the thickest part of a close furze-bush. When taken up, it soon exhibited signs of life, but was quite destitute of feathers. Being kept warm and carefully fed, it grew and recovered its coat. In the Spring following it made its escape; and, in flying across the River Tyne, was heard to give its usual call." On some future occasion I hope to return to this "Animal Biography," which teems with interesting chroniclings of the bygone, when the Great Bustard—gone, probably never to return as a British breeding bird—was, as this old volume states, to be met with "in flocks of fifty or more."

.



COMMON ADDER (MALE)



AND LIZARD (FEMALE)



FROG SPAWN



EGGS JUST HATCHED



TADPOLES IN COURSE



FORE AND HIND LEGS



PERFECT

THE METAMORPHOSIS OF THE FROG

**Bird Migration.**—Respecting the now exploded theory as to Swallows remaining in this country in a torpid state during the winter, a correspondent is good enough to write me that he finds a similar reference in an old popular Natural History. The title of the book and the date of issue he is unable to send, as the cover and title-page are missing. It is, nevertheless, interesting to compare the following account with that previously given. The extracts sent to me are as under :

“There is a circumstance attending the migration of Swallows which wraps this subject in obscurity (migration known and admitted), but we have another account, which serves to prove that numbers of them continue torpid here during the Winter, and, like Bats, make their retreat into old walls, the hollows of trees, or even sink into the deepest lakes, and find security for the Winter season by remaining there in clusters at the bottom. However this latter circumstance may be, their retreat into old walls is too well authenticated to remain a subject of doubt at present.”

And again—

“These facts” (*re* migration) “are proved by incontestable authority; yet it is doubtful whether all Swallows migrate in this manner, or whether they may not be some species of this animal that, though extremely alike, are so internally different as to be differently affected by the approach of Winter.

“We are assured by many, and these are not contemptible authorities, that Swallows hide themselves in holes underground, joined close together, bill against bill and feet against feet. Some inform us that they have seen them taken out of the water, and even from under the ice, in bunches, where they are asserted to pass the Winter without motion. Reaumer, who particularly interested himself in this inquiry, received several accounts of bundles of Swallows being thus found in quarries and under the water, etc., etc. Klein, the naturalist, has brought such a number of proofs in defence of his theory of the torpidity of Swallows during Winter that even the most incredulous must allow that the fact presents some degree of probability.”

There is little doubt that the observers who put on record

the fact that they had seen Swallows "taken out of the water, and even from under the ice, in bunches," were far from speaking the truth, and several other points in these nevertheless interesting records of the past go to prove that our forefathers knew very little indeed of the wonderful subject of migration. But do we? True enough, we have learned a good deal of the migration movements of birds. The dates when they come and leave us, the routes they follow, and so on, are fairly well known to us, thanks in a large measure to the splendid first-hand observations of Mr. W. Eagle Clarke and other ornithologists. We have a great deal that must prove intensely interesting yet to learn, however. What guides these feathered wanderers in their vast migratory journeys over land and sea? How does the little Chiff-chaff, for instance—a mere ball of feathers—find his way to that favourite coppice I know and love so well? How comes it, I ask in all seriousness, that he is there, happy and joyous, just about the same time year after year? He never fails me, and has not done so for many years past. The Tree Pipit, who winters in Africa, Persia and India, always returns, April after April, to his favourite Oak-tree. Here I invariably look and listen for him year by year, and am rarely, if ever, disappointed.

A pair of House Martins nested for several years under the eaves of a house I know very well. The tenant was most interested in his feathered visitors, and one day caught one of the parent birds. He carefully attached a piece of parchment to the bird somewhere near the wing. In any case, being a practical taxidermist, he fastened the missive in such a way that the bird was uninjured or hampered in its movements. He wrote his name and address on the parchment. The next season he caught the bird again. Judge of his surprise when he found the very bird caught the previous season had again returned! The parchment was there, and upon it, strange to relate, was written the name and address of a person in Italy who evidently had also caught the bird! A true story this, absolutely uncoloured. How did this particular bird find its way back to my friend's house, a mere pin-point on the surface of the earth? Why did it not go elsewhere when there were

thousands of other houses in as many other towns, cities and villages? Truly a remarkable episode in bird-life which requires a great deal of elucidation.

"Aye, sir," said an old country rustic to me recently, "the Nightingale always rears a brood in that thick bramble-bush in front of my cottage every year. She has done so as long as I can remember." How does she find her way back all the way from Africa (where she spends the Winter) to that particular bush secluded in a Hertfordshire country lane? The young Cuckoos leave us some time after the adult birds have gone on ahead. The young birds have never previously left our shores. How do they find their way to far-away India and Africa without someone or something to guide them, and what instinct do they possess (if it is not a search for a suitable food-supply in some other country) to aid them in their journeyings? Verily, we know a great deal more than our forefathers in this mysterious phase of bird-life, but there is still much to be learned, and now that Nature-Study is being taken up in a more intelligent spirit, we may look forward to the time when we may hope to see some definite information being forthcoming which will elucidate some of the mystery which at present shrouds this most interesting subject of bird-migration.

We may now pass on to consider briefly some of the salient features of animal life, following and concluding with notes on classification, and then commencing the life-histories of those commoner British species whose biographies we have set ourselves out to consider.

**Distribution and Movements of Animals.**—The important questions of an adequate food-supply and suitable surroundings for breeding purposes are two of the chief agencies that determine the presence of an animal in a given district. The wary Fox would be strangely out of his element in the open country, for he takes a keen delight in living not far away from some rich game preserve in the neighbourhood of woodland. Here he can run to cover with a cunning born within him, and although this sagacious animal is to be found inhabiting wild and desolate tracts of country, it is the exception rather than the rule that Reynard strays far away from his favourite



hunting-ground in the woodland. Climatic conditions affect the distribution and movements of animals—and especially birds—in a very remarkable way, and the great rush to our shores every Spring-time, and also at the Autumn season, of our bird friends has only to be mentioned in support of this statement.

In the south of our island home we are favoured during the Autumn with the presence of a number of most interesting birds who do not pay us a visit at any other period of the year. The cold weather in the North, and a consequent inability on the part of the birds to obtain a suitable food-supply without running the risk of starvation, drives them to the South, where more temperate conditions prevail. Many Waders, Geese, Ducks, Plovers, and a number of sea-birds, too numerous to mention here, join in the long migration stream which flows steadily along our coasts from August onwards. In very rough weather our bird visitors increase in number and variety, and one may observe even well inland such birds as Little Auks, rare visitors from the cold North. Our British Mammals, Reptiles, Amphibians, and Fish, our Crabs and other sea and seashore Fauna, as well as insects, do not of necessity possess such roving dispositions as the birds. Possessing flight powers, it is small wonder perhaps that birds are more fitful and changeable in their movements than any other creatures on the British list. There is much to be learned, however, of the movements of both fresh- and salt-water fishes. Many kinds have undoubtedly their migration periods similar to birds, but it is difficult to ascertain the accurate movements of these inhabitants of the vasty deep, and much that we do pretend to know is merely a matter of conjecture. Many insects resort to districts best suited to their interests. Like the birds and other animals, it is mostly a question of food-supply, the presence of certain plants or trees whereon or wherein the female may lay her eggs being the determining factor. Soil also accounts for the distribution and presence of various kinds of animals. On a chalky stratum various plants flourish which refuse to grow, or do not occur, upon a clayey stratum, or upon gravel. And one might enlarge. And as different kinds of

plants are found growing upon chalk to those tenanted clay lands, so the insects vary too. Certain kinds of Butterflies (the Chalk-hill Blue for example) are only found where flourish wild flowers in their chalky bed. Certain birds resort to the wild downlands and moors; others tenant the woodland, the country lane, the open meadow, the seashore, the river, or the vicinity of our houses. Rabbits love to frequent tracts of country where the soil is light, and they are enabled to make their burrows without undue labour. Moles are found inhabiting rich pasture-lands, where the loamy soil enables them to tunnel through, and where the earthworms, dearly beloved by the velvet-coated gentleman, flourish abundantly. It is remarkable to notice in regard to the distribution and habitats of animals, how strangely out of place some animals appear when taken from their natural surroundings. The Kingfisher is in his element when dashing meteor-like down a stream, but looks curious indeed in a field or wood. The Hare is well suited to an open-country life, but when brought within confined quarters appears to be a different animal altogether. Birds who run and waddle and wade are graceful and entertaining by the shore or on the mud-flats, but strangely foreign when seen along a dusty country road.

The Skylark—if ever there was a bird of the open air and the open country, this is one—is seen at his best when mounting over the hill-top or the meadow-lands, but would strike one as extremely singular if seen hopping about the hedgerows after the manner of a hedgerow-loving bird. If we wish to observe some kinds of insects we take ourselves to the fens or the marshes; others we know full well we shall find in the woodland, others on the moorland, others in the nearest country lane or by the water-side. What a blessed thing it is that wild life varies in this way! This accounts in a large measure for its indescribable charm. Wander where you will, a mile or two, and sometimes less, makes all the difference in the world in the wild folk astir. You strike different surroundings or a different strata, and the scene changes. Wild plants and trees, birds, insects, etc., writ very large, at once change. The kaleidoscope is often very marked and complete. Nature is

ever springing surprises upon us, as it were, and the more we know the more there is to know.

**Clothing of Animals.**—The clothing of animals is a most interesting phase of Nature-Study which might well engage attention. Among the Mammals, for example, we find fur, spines, and other outer coverings. The Birds, as we all know, have feathers; the Reptiles have scales and plates; the Amphibians have naked skins; the Fishes have scales, whilst Crabs, Lobsters, Shrimps, and other similar creatures, have a horny skeleton well known to everyone. Insects do not possess a backbone, and their outer covering consists of a horny skin, which is well shown in many of our British Beetles, such as the handsome Stag Beetle, the Cockchafer, and the Margined Water Beetle. Shellfish, as is well known, possess hard coverings in which to seclude when necessary their soft bodies; the Sea Urchin bears spines like the Hedgehog, but these grow upon a remarkable series of plates of wonderful design, and about which we shall have something to say in Chapter VIII.

It will thus be observed from this brief survey in what an extraordinary manner the clothing of animals differs, and when we pursue the matter further, and come to consider why it is that different classes of animals possess different body coverings, interest in the subject broadens and deepens considerably. The soft fur of the Mole—which can be brushed either way equally well—admirably suits the little animal for burrowing under the soil, and it would ill-suit this ingenious creature to be clothed in feathers like a bird. A similar remark applies to Rabbits, Foxes, Badgers, Rats, and other burrowing animals. The Snake craftily steals through the undergrowth and the impenetrable thicket, full of cruel thorns and other designs for their protection, and it would be a sorry reptile indeed that did not possess some armour such as scales to protect its body and prevent injury coming its way.

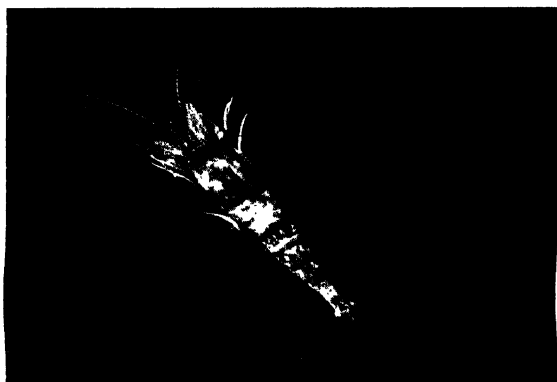
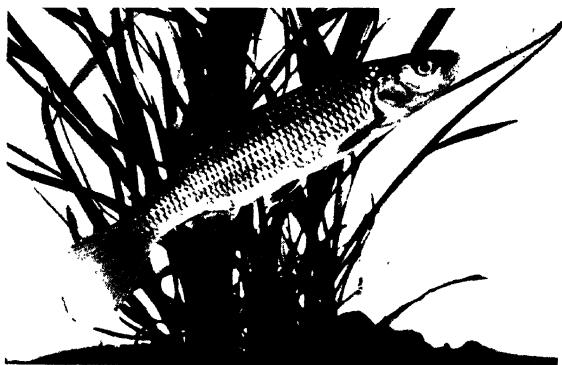
Fish, by means of their spindle-like shape and scales all neatly overlapping one another, are enabled to glide with ease and facility through the water. Crabs, Lobsters, and other creatures are protected from the ravages of other inhabitants of the sea and seashore by their hard outer covering. Various

kinds of Beetles who live underground possess hard body-clothing, which aids them considerably in burrowing under the soil, and no harm befalling them. Shellfish, as everyone knows who has tried to open an Oyster or a Mussel with the fingers, are well protected in their shelly home, whilst Sea Urchins and other creatures far too numerous to mention all possess some distinguishing characteristic in their body-covering which is of distinct service. Whilst the Jellyfish lying stranded upon the beach, or the Giant Octopus upon the shore, look pitiable objects indeed, and harmless to a degree, their tentacles are put to full use when the animals are seen in their natural element, and woe betide the luckless individual coming into contact with them! I am told by one of our foremost naturalists in the North he is of opinion that the ravages of the Jellyfish often account for the sudden disappearance of persons whilst sea-bathing. He states that when a tentacle of the Jellyfish is drawn across a person's body the "sting" is something to be remembered, and when sudden cramp has been assigned as the reason for a bather sinking in the water and being drowned, a large Jellyfish was perhaps, after all, responsible for the calamity. Judging from the huge Jellyfish which I observed stranded upon the shore in Filey Bay one summer, I should imagine a sea-bath in the vicinity would be fraught with a considerable element of danger and unpleasantness.

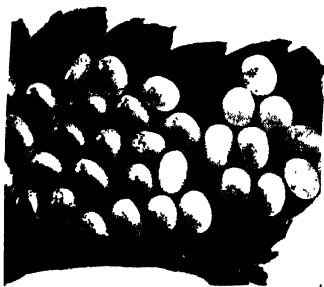
**Protective Coloration.**—Examples of protective coloration in Nature—in mammal, bird, insect, reptile and plant worlds—are many. Among the birds I think there is no more charming representation than a female Pheasant sitting upon her eggs in the woodland. Seated among the dead brown-coloured bracken, she is most difficult to locate, and the vigilant and well-trained eye of the gamekeeper is often put to severe tests to search out the precious game-bird sitting upon her light yellow or olive eggs. I could almost touch a female Pheasant recently, and yet I could not see her, so wonderfully did her form and colouring match the surroundings which she—wise bird—had selected as a nesting site. And not only is this protective coloration apparent in regard to the bird herself, but also with respect to her eggs. I was told off one

Spring to find two nests full of Pheasants' eggs. The exact spot was marked down for me, and then—would you believe it?—I could not find them! Small wonder when the keeper pointed out the eggs to me, for they harmonised most beautifully with the dead leaves still strewn upon the ground. These instances of colour protection in the bird world are, I think, prominently displayed to us when the dead bracken and leaves of a past Summer are still to be seen, and afford an interesting example of how solicitous and thoughtful Dame Nature is for the well-being of her feathered children.

I have seen Snipe and Woodcock sitting on their nests, or skulking in the undergrowth, and the protective coloration is very remarkable. And when we come to consider the nests, nesting sites and eggs of birds, this protective resemblance becomes all the more marked. The eggs of some shore-birds are laid among the bare shingle, and so nearly do they match their surroundings that it is only the trained eye that can locate them. With several young birds it is the same, for when they squat, once having lost sight of them it is with difficulty they are picked out again. A Wren's nest built in a haystack or among bracken, a Chaffinch's nest cleverly woven in the fork of a tree, a Robin's homestead dexterously placed in a grassy bankside, and many other instances, might be mentioned where birds' nests match their surroundings in a remarkable degree. Then, when we come to consider the animals themselves, many interesting characteristics rise before us. Observe a Rabbit bolting across a riding in a wood, and as it reaches cover it stops short and becomes motionless. You reach the spot where it is undoubtedly in hiding, but for the life of you, you cannot locate it, so nearly does the brown and white fur of the crafty rascal harmonise with the undergrowth. Even if a stone is pitched right on to the animal's back the probability is he will not move a muscle, and not until you move your footsteps onwards will the Rabbit scuttle away to his underground home at the edge of the wood. Some fishes have the power of changing colour in a very remarkable manner, so much so that even when kept within the confines of a small aquarium it is quite difficult to observe them. I have observed



COMMON SHRIMP



EGGS ON BLACKTHORN LEAF,  
HIGHLY MAGNIFIED



LARVA



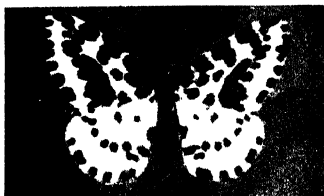
PUPA IN SILKEN HAMMOCK



EMPTY EGG CELLS



FEMALE CURRANT MOTHS



MALE CURRANT MOTHS

Frogs and Toads in the lush meadows whose bodies were so coloured that one could almost step upon them, so like were they to the herbage surrounding them; whilst in the insect world—perhaps more than any other—examples of protective form and coloration are almost legion.

Many larvæ so admirably match their food plants that it is difficult—even on close inspection—to observe any living creature upon them. The pupæ often harmonise in a very wonderful way with the situations in which they are secreted, whilst the imagines, or perfect insects, often exhibit this most interesting resemblance to the plants and other objects they frequent.

**Other Designs for Protective Purposes.**—There are other designs for protection and preservation than that of protective form or coloration. Many birds place their nests in inaccessible situations, such as the face of a precipitous sea-cliff or mountain-top; on the topmost or outermost branches of tall trees; deeply hidden among herbage (and those who have searched in vain for the nest of the Skylark know what that means); deftly woven at the base of a thick bush (the Nightingale, for example), and so on. The wise Ant posts sentinels at the city gates to prevent the intrusion of strangers; the Spider spins a thread, across which it can run, Blondin-like, with agility to its hiding-place when disturbed; and many animals have weapons of defence (some real, some imaginary), such as Crabs, Lobsters, Birds of Prey, Hedgehogs, Sea-Urchins, Stag Beetles, the Devil's Coach-Horse, the Earwig, etc.

Some animals who on first sight appear formidable are perfectly harmless, such as the various kinds of Dragon Flies, the Giant-tailed Wasp, the Newt, Centipede, Millipede, Wood Lice, etc. Some animals, such as Hedgehogs, Millipedes, and Wood Lice roll into a ball when touched, or curl round; others feign death in a very realistic manner. The Lizard, when captured and held by the tail, has the power of snapping off a portion of this appendage and so making good its escape, the observer standing amazed as one moment he finds himself possessed of one of these reptiles and the next a portion of the tail only!



The young of many kinds of animals are well able to take care of themselves almost directly they are born, especially when reared in such open situations that numerous enemies beset them. Baby Moorhens take to the water and swim within the first few moments of their lives; a young Fawn can do the same thing; and it is all in the natural order of things that the young of animals born underground, or which are safely hidden away, are often found to be naked, blind and helpless. The mother Adder—in spite of statements to the contrary—receives into her mouth her young ones when they are in danger, and the mother Earwig is as solicitous for the safety and upbringing of her young brood as the most careful Hen; whilst most insects lay their eggs and take no further heed of them, the Earwig is a brilliant exception of this rule. The Badger digs out huge “earths” in which the family may be safely and comfortably sheltered; many birds, such as Woodpeckers, the Wryneck, the Nuthatch, the Tree-Creeper, some of the Owls, the Starling, several of the Titmice family, and others, lay their eggs in the inaccessible holes of trees and behind the crevices and bark.

**Animal Homesteads.**—We may here consider briefly the remarkable cleverness exhibited by some animals in building a homestead. Whilst some kinds are contented with a mere apology for a nest, others are more particular and construct most wonderful habitations. The nest of a Hornet or a common Wasp; the underground galleries and nest of the Mole; the nests of the Goldfinch, the Long-tailed Tit, the Gold-crest, and the Chaffinch; the nest of the Dormouse or the Harvest Mouse; the huge nests of some birds such as the Raven, the Buzzard, and the Osprey; the cells constructed by the Leaf-cutter Bees and the Mason Bee; the Ant citadel, and its remarkable avenues, and pathways, and chambers; the larval and pupal case of the Caddis Fly—such are a few examples of wonderful homesteads which exhibit on the part of their owners great intelligence, industry, care, and cleverness.

**Reproductive Powers.**—The reproductive powers of animals is another phase of animal life which might well engage the attention of the young naturalist, and is a subject

upon which he might specialise and become quite an authority. Whilst some birds, like the Guillemot, Gannet, and Puffin, lay one solitary egg, others, like the Ring Dove, the Turtle Dove, the Nightjar, and others, lay two eggs. Some birds, and many of the smaller ones, like the Long-tailed Tit, often lay a clutch of more than a dozen eggs, and in a nest of the Pheasant I have myself observed as many as forty-three. This large number was doubtless the produce of several females, perhaps five. Fishes and insects lay an enormous number of eggs, there being so many enemies who consider the same a great delicacy. Some animals are most remarkable in regard to the age at which they commence to breed, and the rapidity with which they increase. Rabbits, Rats, the Green Fly or Amazing Aphis, House Sparrows, and others of Nature's Children, may be mentioned in this respect.

**Devotion of Animals towards their Offspring.**—It is pleasant to notice that most kinds of animals (insects excepted) exhibit much devotion and solicitude towards their young. True enough, in the bird world there is one bird who lays her egg and cares no more about its ultimate fate (at least, so far as we at present know)—namely, the Cuckoo; but nearly every bird on the British list, at any rate, is most solicitous towards its offspring. To my mind the amount of devotion birds show towards their chicks is one of the most remarkable traits in their character. What journeyings to and from the nest with food; what patience and endurance the mother bird exhibits as first she sits tight upon the treasures and brings them safe into the world, and then continues to shelter them until they are fledged sufficiently to be left uncovered; what splendid systems of sanitation most birds adopt (Rooks and some sea-birds, such as Shags and Cormorants, excepted); and what intense interest and perseverance birds display towards their offspring! I have experienced many happy days in Birdland, prying into the home life of these delightful creatures, and on many occasions I have known a mother Robin, Song Thrush, or Hedge Sparrow to allow one to lift her bodily off the nest rather than she should stand the risk of exposing her blind and almost naked fledgelings to the cold. Wild creatures have

come to realise that man is their remorseless enemy. They are afraid of us; they hie away at our approach. In foreign countries where human foot has rarely trod nor civilisation penetrated, birds and other animals, we are told by authentic eyewitnesses, show not the slightest concern at man's presence. How different it is at home, when every bird and other creature almost hurries away, scared, timorous, and afraid of us. Once, however, an animal learns that it receives protection—or, if you like, is not in any way disturbed—it will take full advantage of our kindness, as witness the birds who return year after year to the same nesting haunts and please and entertain us by their presence and song and winning ways.

**Language of Animals.**—The language of animals might receive lengthy attention, but we must of necessity consider this vastly interesting subject briefly. Whilst our friend the Frog utters a mere croak, and Fish for the most part are, so far as we know, entirely mute, as are also various Reptiles, Insects, etc., Birds, as everyone is aware, utter calls, cries, and songs of most varied and often beautiful descriptions. The Fox barks, the Rabbit squeals, the Owl hoots and hisses, the Jay screams, and so one might enlarge did space permit. Yet we know very little indeed of the means of communication that animals adopt towards one another, for some kinds, such as Bats, Squirrels, Hares, Deer, Hedgehogs, Moles, Insects, Crabs and their allies, and the lower forms of animal life, as well as the higher and the highest, are apparently mute! Here again is a wide field for observation and research, open to the young inquirer into the operations of Nature, and a wealth of unknown secrets waiting to be unravelled.

**Courtship and Pairing Days.**—The courtship and pairing habits of animals are exceedingly interesting. I once watched a dog Fox caressing a vixen, and as the two animals carried out their interesting love actions in broad daylight, it was a fine sight to observe them playing about in the sunshine. With measured tread the dog Fox threaded his way across a meadow, every now and then sidling up to the Vixen and caressing her in a most interesting manner. Battles often rage fast and furious between male animals for the possession

of a female. Cock Pheasants fight like very demons, and courtship days in Birdland are among the most interesting of any of Nature's wild folk. Of these we shall have more to say in our Bird chapter. Male Crabs have terrible combats, and it is a common occurrence for one or both of them to lose a claw or other portion of their limbs. The male of the Great Crested Newt puts on a fine crest during the breeding season, and a somewhat similar habit prevails in Puffin-land, the male Puffin assuming a handsome sheath on his bill at the commencement of the pairing season, and this sheath, curious to relate, drops off after the nesting season is completed. Spiders are intensely entertaining to watch when they are mating, and the male has to have all his wits about him to come out of the trying ordeal successfully, for the female does not stop at trifles, and will eat him if he, on his part, causes her the slightest displeasure or provocation. It is interesting to notice in this very brief survey of animal love-making that several kinds of British birds, at any rate, pair for life, such as the Nuthatch, Bullfinch, Raven, Peregrine Falcon, and others. This, to my mind, is a most remarkable trait in the character of a perfectly wild creature, and says much for the devotion and attachment of both the male and the female. I am of opinion that there are several other kinds of birds who pair for life, and careful and accurate observation on this subject by the young naturalist should elicit a great amount of useful information.

**Feeding Habits.**—The various ways in which food is procured opens up another most interesting question. Bats, as almost everyone knows, pursue insects in the air, and possess most extraordinary endurance upon the wing. Birds vary in a most remarkable degree as to their feeding habits. Whilst Woodpeckers, Tree-Creepers, Nuthatches, Titmice, and other birds sedulously examine tree-trunks and branches of trees for insects, their eggs or larvæ, there are other kinds, such as Swallows, Martins, Swifts, Nightjars, etc., who always feed upon the wing. Finches mostly obtain their food on or near the ground. Some of the Warblers perform little journeys from a watch-tower, and snatch at passing insects. The Owl quarters the ground at nightfall for Mice, Rats, Frogs,

stray young Pheasants, and other tit-bits. Kestrels, Sparrow Hawks, and other birds of prey, hover in the air: having perceived an object upon the earth beneath, they dash down like a lightning-flash and snatch up their prey. Gannets and other sea-birds who live almost, if not quite, exclusively on fish soar in the air, and dart down into the sea meteor-like and secure their victims. Moorhens, Coots, Grebes, Ducks, Cormorants, Shags, and other birds, are expert divers after food. Red-shanks, Curlews, Whimbrels, Snipe, and similar species, probe about on the mud-flats with their long beaks after various creatures; whilst the Heron stands by means of his long legs in the water and waits a favourable opportunity of darting upon a rat, eel, or other animal, and transfixing the same by means of his formidable beak, or he will beat his wings upon the water and drive a shoal of small fish into the shallows, and then make havoc among them.

Rooks, Starlings, and Jackdaws, as all observant people know, most assiduously and diligently search arable and pasture lands in search of various insect food, whilst Buntings and other similar birds resort to stackyards and other places, and feed upon grain-seeds. Goldfinches, Linnets, and Greenfinches dearly love to perch upon a strong Thistle-plant and take toll from the seed-heads; whilst Ring Doves (greedy birds that they are) play sad havoc among young Turnips. Some animals procure their food by day, others at nightfall. The Fox, the Badger, the Nightjar, the Bat, the Hedgehog, the Earwig, a large number of Moths and other insects, Owls (excepting the Short-eared species, which is diurnal in its habits), and various other wild folk, all come under the last-named category. Frogs and Toads thrust their tongues out of their mouths rapidly and lick in insects, as it were. Slugs, Snails, and other creeping animals, are more slow and deliberate in their work of satisfying their hunger; whilst anglers are well aware that whereas some kinds of fish come on the feed first thing in the morning, others do not dine until late in the evening. Rats and Mice are mostly nocturnal in their habits, as those who set traps for these creatures of an evening well know. The high revels which the common House Mice enjoy when

we are slumbering in our beds are common knowledge. The Stoat and Weasel (judging by the number I have seen caught in the keeper's traps during the night-time) must be regarded as night-prowlers, whilst my sojourns in the neighbourhood of the woodland during the early morning and late afternoon lead me to suppose that Rabbits mostly enjoy an early and a late repast. To accurately determine when and how the food of animals who live underground or in dark places is obtained is to a great extent a matter of conjecture. Creatures like Millipedes and Centipedes are probably night-feeders; and when we come to consider the feeding habits of many common inhabitants of the vasty deep, we realise that whereas some feed at low tide, others pursue their meals at full tide; some feed in shallow, others in deep, water. The Perch loves a deep hole; the Trout a shallow, gravelly-bottomed, clear-running stream. The Tench revels in mud; the Bream loves to come to the surface. Eels burrow in the mud, and I have caught them with rod and line sometimes when fishing very deep, and have had to literally pull them from their hiding-places.

Some fish rise to the surface for food (as fly-fishermen are well able to tell you); there are others who rarely, if ever, come to the surface of the water for feeding purposes. Gudgeon especially are bottom-feeders, so also is the Loach. Earth-worms lie out at nights—especially when it has been raining or there is a heavy dew—and take down into their holes the leaves of plants, etc., and deposit their castings during the night hours.

**Uses of Animals.**—We may here consider the uses of animals as regards the good they do, and the products we obtain from them which we find of service. We will briefly run through the whole list of orders with which we treat in this volume, which brings us at once to the useful Bats. These strange folk feed exclusively upon insects, and although they are infested with parasites, and are not particularly clean animals to shelter in a homestead, they do an immense amount of good in ridding the air of countless myriads of insect pests, which, unless thus preyed upon, would probably make human life almost intolerable. Although the Hedgehog is extremely

fond of Pheasants' and Partridges' eggs, as I have proved for myself beyond measure, and will also make raid on the hen-house, it lives to a great extent upon worms and insects. It should be stated here with emphasis that whilst Earthworms and other creatures are in themselves of service to us, in keeping in check by natural means even those animals which are of us, many wild folk perform good and useful work inasmuch as they are Nature's own balance-keepers. The Mole has a prodigious appetite, and I have known it to die for want of food during the night-time. Although accused of doing damage in gardens, fields, on lawns, and other places, it should not be forgotten that this ingenious little animal lives on many hurtful and injurious insects, that it helps to turn over clogged soil, and its tunnellings help to drain the land; and it also preys upon Mice, Shrews, small Reptiles, Frogs, etc.

The Stoat and Weasel keep wild birds in check, as also Rabbits, whilst when the Fox is not prowling around a hen-house or the keeper's game preserves, such animals as Rabbits, Rats, Hedgehogs, Mice, and other creatures are eaten. None of the species claiming kinship with the Rodentia, such as Squirrels, Dormice, Rats, Mice, Voles, Hares, and Rabbits, perform an abundance of good deeds so far as we know, but each in its way may be useful as a natural balance-keeper. The Ungulata (the Deer) and the Cetacea (the Whales and Porpoises) do not call for special mention, and this brings us to the Birds. Strictly speaking, there are very few birds indeed which, so far as we know, do more harm than good. A large number of our own British birds feed exclusively on an insect diet (especially our Summer migrants), whilst others feed almost entirely on the seeds of obnoxious and hurtful weeds; others, again, are scavengers, and devour carrion and garbage of different kinds. During some part of the year it is true that birds like Starlings, Blackbirds, Thrushes, and other feathered folk, do an amount of harm to fruit and grain crops, which at times is most annoying; but one should not hastily conclude as a result of their depredations during a certain part of the year that more harm than good is done, and an accurate analysis should be made of the dietary through-



CELESTINE BUTTERFLY





*PLATE X*



out a whole year. The inestimable good performed by the Swallow tribe, the Warblers, the Finches (with one or two exceptions), the Wagtails, the Titmice, the Woodpeckers, the Owls, and others, is now well known. Insects are preyed upon to an incalculable extent; weed seeds are devoured wholesale and so kept under; various Rodents, such as Rats, Mice, Rabbits, etc., are kept within respectable limits *when their natural enemies are not destroyed*; and in various other ways birds perform good and useful work.

Our British Reptiles and Amphibians live to a great extent upon insects, and several of them are of economic value to us. The Grass Snake is very fond of young birds, as we shall tell in Chapter IV.; whilst it also devours Frogs, Toads, Mice, Newts, etc. A similar diet is partaken of by the Adder. The Frogs and Toads are almost exclusively insectivorous (but they love Earthworms too), whilst the Newts are of service as balance-keepers, feeding as they do upon Frog Tadpoles, which, if all came to maturity, would result in us being absolutely infested with these creatures. Fish may be divided into three feeding classes, such as carnivorous, herbivorous, and insectivorous. Many of them keep down insects; some live on offal, which is well got rid of; some keep various Crustaceans in check, and so on.

Many kinds of British insects, such as Ladybirds, Lace-wing Flies, Dragon Flies, Ichneumon Flies, and even our too-despised friend the Wasp, perform considerable service, and various members of the other groups of animals with which we treat are of value in one way or another. It should be stated with emphasis how unwise it is to condemn an animal for some of its misdeeds alone, and before arriving at a conclusion as to the place it occupies in the economy of Nature, its whole life-history should be practically and steadfastly pursued. I am still of the opinion that, *judged for a whole year*, the House Sparrow does more good than harm; but I am on debatable ground now, and must proceed. I should point out, however, before finally leaving this subject of food, that a bird, for example, that is inimical to the interests of the sportsman and the game preserver, such as the Sparrow Hawk, the Owl, and

the Kestrel, may be, and indeed is, of the greatest possible service to the agriculturist, and perchance others. In this wise it is often the greatest difficulty to draw a line or make a hard-and-fast rule.

**Animal Products.**—The products of wild animals on the British list are not of a lengthy description. If we were treating of animals of the world, we should have a different tale to tell, for we obtain ivory from the tusks of the Elephant and the Walrus; fur- and hair-bearing animals (Beavers, Sables, Opossums, Chinchillas, Lemurs, and others) supply materials for clothing; from Whales come oil, ambergris, and whale-bone; from Crocodiles and various Lizards and Turtles we obtain skins for ornamental and also useful purposes, as well as tortoise-shell; ornamental leather is made from the skin of Dogfishes and Sharks; whilst two of our British fresh-water inhabitants—namely, Dace and Bleak—enable us to turn their scales into artificial pearls. The Oyster, as everyone knows, produces the real genuine pearl. Various dyes are obtained from some animals, and a product of some importance is obtained from some of the Scale Insects. Of the feathers, wings, and even the wretched carcasses of birds which are used for millinery purposes, we do not wish to speak at length in view of the ruthless and cruel destruction of the world's Avi-Fauna which takes place as a result. Suffice it to say that we are decidedly of opinion that a lady's hat may be made to look more ornamental and decorative if trimmed with ribbons, lace, or imitation flowers, etc., than if, as we have so often seen, it contained a mere caricature of bird-life. Rabbits, Hares, various Birds, Edible Frogs and Snails, Deer, Crabs, Lobsters, Shell-fish, and other animals, supply us to a very great extent with food; so that if we merely consider the usefulness and economic value of the Fauna of our own country, it will at once be seen what a number of animals are of service in some way or other when the subject comes to be considered. We may now briefly consider the powers of movement possessed by our British animals, and they are as diverse as they are entertaining.

**Locomotive Powers of Animals.**—Bats are our only Mammals who possess the power of flight, and are placed

right at the head of the Mammalia. They are our own successful rivals in these flight powers, and we have yet to make very rapid strides in our flying-machines, and aeroplanes, and kites, and what not, before we can hope to imitate, much less excel, them.

Hedgehogs and Moles can run with alacrity when necessity desires them to do so. Observe a Mole above ground; rush to the spot immediately: the probability is you will arrive too late, for the little velvet-clad animal will have outdistanced you, no matter how fleet of foot you may be. Foxes, as huntsmen know, are splendid runners, and possess wonderful powers of endurance, whilst Stoats and Weasels are remarkably sharp and active in slipping through and underneath hedgerows and other places. When in open country it is not such a difficult matter to capture them, but give them a few feet of cover and your efforts will be frustrated. Squirrels scamper round tree-trunks and run and spring with wonderful precision and quickness of movement in the tree-tops. Rats and Mice are as quick as lightning, as those who try to catch them well know. Hares, being so fleet of foot, are largely used for coursing purposes, and frequently outdistance the finest and fleetest greyhound. Rabbits can and do bolt with great speed, turning up their white bobtails as a danger-signal to their fellows. Deer, as is well known, run well, jump high, and, what is not so well known, swim with ease and facility. Whales and Porpoises, although popularly regarded as Fish, are Mammals, like you and I, as we shall show in our next chapter, and are admirably suited for an aquatic life. Birds walk, hop, strut, and fly—some leisurely, some with lightning rapidity. Some birds soar (the Skylark and Meadow Pipit); some hover (the Kestrel); some fly high (Geese, Ducks, and Waders); some low (Blackbirds, Robins, and others). The movements of our bird friends alone present a wonderful abundance of interesting examples of locomotion powers which might well engage the young naturalist's attention; for, as a result of careful observation and study, he will be able to identify a bird even by its movement.

Reptiles (Snakes) craftily steal through the undergrowth, and

spring with quick, rapid movements. Frogs and Toads hop, much to the discomfiture of the ladies; whilst Fish swim and dart and jump. Crabs, Lobsters, and other similar creatures, are ungainly in their movements on land, but in the water propel their bodies along with remarkable execution. Insects crawl, run, or fly; some burrow underground in most ingenious and clever ways. Some live upon or under the ground exclusively, and are denuded of wings; others live almost entirely in the air. Some kinds of insects possess wonderful control over their flight powers (the Dragon Fly, as an example); others, such as the Dor Beetle and the Cockchafer, appear to blunder along in a most bewildering manner. Some animals, such as Snails and Slugs, are slow in their movements; others, such as Earthworms, "bolt" into their holes; others, like the Earwig, the Cockroach, and the Centipede, run so quickly, and hide in some crevice, that it is a difficult matter to catch them. Whilst various kinds of inhabitants of the sea, such as Shellfish, Sea Urchins, Starfishes, and Jellyfishes find themselves stranded upon the shore, and many of them have to wait for an incoming tide to take them back to their natural element again, when in their native habitat they crawl or swim with ease and facility. We have rapidly run through the locomotive powers of our British animals only, but enough has been written, we hope, to direct attention to this branch of Natural History study.

**Solitary and Social Habits.**—The solitary and social habits of animals open up a whole series of interesting and entertaining questions. Among solitary animals that may be mentioned are Hedgehogs, Moles, Wild Cats, Foxes, Stoats, Weasels, Squirrels, Dormice, Hares, Whales; many kinds of birds, such as Peregrine Falcons, Blackbirds, Woodpeckers, Tree-Creepers, Wrynecks, Ravens, Crows, Kingfishers, Bullfinches, Nightjars, Cuckoos, Owls, Warblers, Eagles, Hawks, and others too numerous to mention; Snakes; some Fishes, such as Trout, Pike, and others; some Insects (such as Mason and Leaf-Cutter Bees, Wood Wasps, and many kinds of Butterflies and Moths, Beetles, etc.), and so on. Whilst some of the above animals are often found in close proximity to one another,

and in Winter-time go about in packs, companies, or flocks, they are mostly solitary in their nesting or breeding habits, and as such we may discriminate between them and the social forms of wild life. Under this last-named head come Bats, Rats, Mice, Rabbits, Deer, Porpoises, Seals; some birds, such as Guillemots, Gannets, Gulls, Puffins, Shags, Terns, Rooks, Jackdaws, Starlings, Herons, Swifts, Martins, Razorbills, etc.; Frogs (mostly solitary excepting during the breeding season and in the tadpole stage); some Fishes, such as Gudgeon, Roach, Dace, Minnows, Perch, Rudd, Bream, Sticklebacks, etc.; many kinds of insects, such as the true Wasps, Hive Bees, Aphides, Gnats, Grasshoppers, Ants, House Flies, Fleas, etc.; whilst the social conditions that exist among various kinds of Shellfish, such as Limpets, Oysters, Mussels, Barnacles, Winkles, Whelks, and others, will be patent to all those who have observed the numerous colonies of these creatures in the vicinity of the seashore. It would be interesting to carry this part of our story still farther, and consider how and under what conditions these solitary and social habits of our British animals avail the creatures, and the reason assigned for this great divergence; but we can do no more than direct careful attention to this vastly important subject, and pass on.

**Hardiness, Tenacity and Age of Animals.**—We may now consider the hardiness and tenacity of some animals and the duration of their lives. It is remarkable to notice how some animals manage to eke out an existence during even the comparatively mild winters which we generally experience in this country nowadays. Perhaps among some of our bird friends and insects this is more particularly noticeable. Who, for example, has not watched small birds, such as Tits, Wrens, Chaffinches, and others, on a winter's morning feeding in the garden, and been amazed at the difficulty such birds must experience in procuring food when the land is frost-bound? To suspend cocoa-nut husks containing suet and other tit-bits, or to put out a pan of water or food in some sort of receptacle, during Winter-time will result in many interesting and amusing observations being made in Birdland, beyond which one is conscious of the fact that something is being done to enable the

birds to eke out an existence during the rigours of hard weather. Tits, Starlings, Thrushes, Blackbirds, various Finches, Robins, Wrens, Hedge Sparrows, and others, are almost sure to be constant visitors to the garden in Winter, and their various habits, and even the manner in which they approach the food, cannot fail to afford an amount of interest. Many people imagine that birds die of cold, but they do not suffer the penalty of death from this cause so much as from hunger. Yet is it not remarkable to notice the few birds which one observes even during a prolonged frost who have succumbed. Indeed, it is still more remarkable to notice the comparatively few dead animals one sees in the country who have died a natural death.

This opens up the most interesting question as to when, and how, and where, do wild animals die? Many, we know, are killed by design, others by accident; but it is a remarkable fact that, excepting on rare occasions, it is an uncommon experience to find an animal who has died a natural death. It is astonishing to notice how, even during the depth of Winter, insect life still abounds. If there be sunshine on a hard frosty day little Gnats may be seen dancing gaily in the air, as if it was the height of Summer; whilst underneath stones, pieces of timber, and other places, various insect folk may frequently be disturbed, who prove exceedingly lively and frolicsome. It seems extraordinary that when we ourselves are suffering from the cold, with chilblains on our feet and hands, chapped faces and other ailments, mere atoms of life, as it were, gaily disport themselves in the open air, and seem to be entirely oblivious of the wintry surroundings. As to the duration of animals' lives we know comparatively little, and here again is a splendid opportunity for young naturalists to inquire into the longevity of wild folk. Whilst we are on fairly intimate terms of acquaintance with the ages of domestic animals, such as Horses, Dogs, Cats, Cows, Sheep, Pigs, and various wild creatures such as Eagles, Elephants, Rhinoceri, Hippopotami, Lions, Tigers, etc., *when kept in Zoological Gardens and the like*, our knowledge of the ages which wild animals reach in their natural states is of a most elementary and woefully meagre

description. Some insects, we know, take a series of years to develop into the perfect state; others perform the feat in a very short time. The May Fly, having taken a considerable time to go through its wonderful metamorphosis, often lives only a few hours as an imago, or perfect creature. A great many insects, such as Wasps, Bees, and particularly Butterflies and Moths, live for a season only, with the exception of the Queens of the first named, who hibernate until the following Spring. The Giant Tortoises from the Galapagos Islands are said to be some hundreds of years old, and whilst there are authentic records of birds, such as Parrots, Eagles, and others, living beyond even man's allotted span, we have no accurate or detailed information concerning the general age which many of our wild creatures attain.

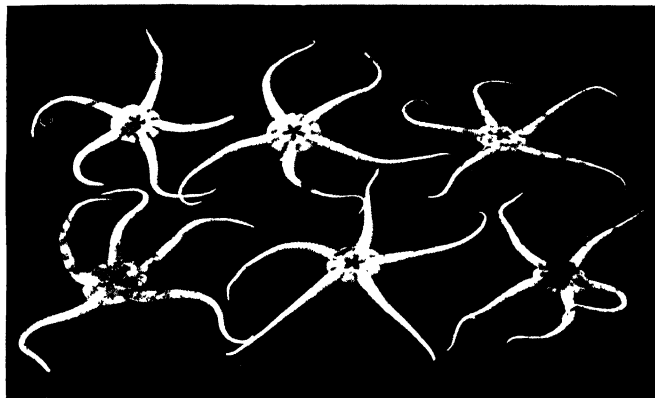
**Ignorance and Superstition.**—It is our aim in this introductory chapter to draw attention to several branches of Natural History study which may well engage the young naturalist's attention, and we have already mentioned several salient points which require probing into. A mass of ignorance and superstition and popular animal fallacies also require sweeping away, and it is not too much to hope, in view of the great amount of attention now being paid to wild Nature's ways, that people generally will before long possess a better and more accurate knowledge of the correct biographies of wild folk than now prevails. It is perfectly astonishing to those whose rambles take them into remote country districts to observe how intensely ignorant even country people are concerning the wild folk by whom they are surrounded, and how steadfastly they cling to old superstitions and fallacies which have been handed down from generation to generation. I know a countryman who absolutely refuses to believe that what his father and grandfather told him concerning the mythical statement that a Cuckoo turns into a Hawk during the Winter is incorrect, and I could write at some length concerning stupid and erroneous ideas that still prevail as to an animal's place in the economy of Nature. A correspondent wrote me recently respecting the Giant-tailed Wasp (*Sirex gigas*), the female of which possesses a long ovipositor at the



extremity of the body. He imagined an insect of such proportions, and with such a "sting," would be able to "sting" a person to death, whereas the creature is perfectly innocent, and cannot sting, because it does not possess the apparatus wherewith to do so! And so the snowball would increase if we were to linger over this phase of our subject. We can do no more, however, on the present occasion than direct attention to this matter, and then, as we come to consider the life-histories of the animals we are to deal with, point out several other fallacies as we proceed.

**Wonders revealed by the Microscope.**—Before coming to our concluding portion of this lengthy introductory chapter, I should rather like to mention the fascinating study of minute life through the agency of a high-power microscope, the secrets the microscope reveals, and then, before dealing with Classification, Vertebrates and Invertebrates, mention a few animals which have become extinct or exterminated within comparatively recent times. To my mind one of the most wonderful of the many absorbing branches of Nature-Study is that of minute life. Creatures invisible to the naked eye are, when examined through a microscope, found in many instances to be perfectly formed, with limbs, nerves, bloodvessels, and other organs too numerous to mention; and the young aspirant in Nature-Study would find it a congenial and vastly interesting occupation to examine some of these minute forms of life unseen by the naked eye.

Just as I started to write these notes a very diminutive winged insect fell upon the paper and commenced to walk across it. I put down my pen and sat wondering and musing. The little atom fascinated me! I marvelled whence the tiny creature had come, and what caused it to fling itself upon my manuscript sheet. Why did it not fall elsewhere? How came it that it was thrust, so to speak, under my notice? It came as if blown by the wind through the open study window, and an examination revealed the fact that it was partly crumpled up as a result of the shock consequent upon its fall. How quickly the mere but mighty atom recovered consciousness! It quickly pulled its legs, wings and antennæ into position, and



SAND STARFISH



MONK HORSE URCHIN



VIOLET SEA ANEMONE



BATH SPONGE.  
HYPSPONGIA CLAVATA  
(Linn.) Lamour. (Plate VII, fig. 1.)

TURKEY SPONGE.  
SPONGIA MAGNIFICA  
(Linn.) Lamour. (Plate VII, fig. 2.)

BATH AND TURKEY



POLYCYSTINA

set itself up with assurance. Brave little speck of life, full of courage and hope! I thought as I watched my insect visitor. As I sat musing and meditating many thoughts occurred to me. What splendid material the insect was made of! how beautifully fashioned and fitted together to stand such a whirl and knock without being disjointed, severed, sprained, or splintered! Every fragile portion of the insect's little body seemed ready and eager for immediate action. See how merrily he runs across the paper, every part moving, nay, thrilling and spinning with quick velocity. How can one describe even a little episode in the great world of life such as this? Where such a variety of parts and actions are seen, it would require not only the keenest and closest observation, but one would have to possess some knowledge of insect mechanism and gift of descriptive language. To describe accurately the impressions one feels on examining the organism of such a creature is difficult to accomplish. It may not appear so at first sight, but try it, dear reader, for yourself, and you will appreciate the difficulty of endeavouring to get an intimate insight into the laws of Nature which regulate and govern the actions of such a tiny speck of living matter. A fine-pointed pen is requisite to write an accurate biography, and the words need to be written in very small letters to harmonize with the subject. At least, so it seems to me, and I hope the reader will agree. Let us now pass on.

### **Extinction and Decrease of Animals, and the Reasons.**

—The reclamation of marsh-lands, the draining of the fen country, the onward march of civilisation, the greed of indiscriminate collectors, illegitimate (and so-called) sportsmen, have each in their way been responsible for the expulsion from our island home of a number of interesting animals, and the total extermination elsewhere of some species off the face of the habitable globe. We have already referred in this chapter to the extinction of the Great Bustard as a British bird, whilst other most interesting birds which we have lost as breeding species may be mentioned in the Avocet, the Ruff, the Black-tailed Godwit, the Spoonbill, the Black Tern, etc. The capture\* of the last living specimen of the Great Auk,

some sixty odd years ago only, is a sad story, and my readers will be aware of how its eggs are already of almost priceless worth. Few people imagine that Bears, Wild Boars, Beavers, Wolves, and even the Rhinoceros, roamed about the British Isles many, many years ago; yet such is the case, as their remains and records prove to us. The few herds of Park Cattle which are still found in this country are the semi-domesticated descendants of the great extinct Bull, *Bos primigenius*, or the Urus, or Aurochs. This monster measured several feet from one horn-tip to the other, and was almost as high as an Elephant. Many kinds of animals have become rare within recent times, such as the Wild Cat, the Polecat, the Badger, the Kite, the Buzzard, the Harriers, the Dotterel, many kinds of insects, etc. Whilst man has to a great extent been responsible for this extinction and diminution in an animal's numbers, when we come to consider that previous to the advent of mankind upon the earth great changes were taking place, the matter becomes most complex and too elaborate in its detail to enable us to grapple with it on the present occasion. The Great Auk, for example, has become extinct within modern times, within the memory of living naturalists. Yet this interesting bird (whose nearest living relative is the Razorbill) was not hunted down so far as we know, but appeared to simply dwindle down and then die out of existence. Climatic conditions have of necessity had a great deal to do with these exterminating influences. New forms of animals have, as Sir Ray Lankester points out in his most fascinating book, entitled "Extinct Animals," "gradually taken the place of the old forms—for no piece of land remains the same for many years. A thousand years, as I have said, in this matter is merely nothing, but even in a thousand years we get great changes in the surface of the land. Land may rise far above the sea, and what was an island becomes part of a continent, and what was part of a continent may partly sink, and become an island—that is, the connection between it and the continent may become covered with water; and then the conditions of life for the animals are very much changed. Such currents as the Gulf Stream are affected by this alteration in land and water. Were certain

changes to take place, the warm water of the Gulf Stream would no longer warm certain land ; the climate would become colder than the animals have been accustomed to. The animals that could not stand the cold would die out, whilst those that could stand the cold would flourish. All I would say is that changes in the disposition of land and water have been a great cause in changing the forms of animals, and in bringing about the extinction of one set and the flourishing of another set."

When we come to consider the huge monsters who roamed about the world in foreign and colonial climes, such as the Mammoth, and enormous aquatic Scorpion-like creatures, a fund of wonder and awe is portrayed before us. Not only have we to include among extinct animals such creatures as have been briefly referred to, as well as Fishes, Amphibians, Reptiles, and other forms of wild life, but there are a vast number of countless millions of smaller creatures besides, such as the shells of Molluscs, etc., whose fossils are continually being excavated in most unlikely places. The great difficulty with which we are confronted is to be able with any degree of clearness to accurately conceive the age of the Earth, and the exact period when these extinct animals were living, and, let us hope, happy creatures. There is, to say the least, a peculiar fascination and satisfaction in studying these animal biographies of bygone days, and a knowledge of the form and character of our various Strata, of Geology (which reveals to us in a wonderful way the secrets of many of these hidden mysteries), of Classification, Morphology, Comparative Anatomy, and of the living animals of to-day, cannot fail to afford an immense amount of interest and intelligent recreation to young and old alike.

**The So-called "Fairy-Tales" of Science.**—Mere imagination does not enter within the domain of scientific observation and research, and, as Sir Ray Lankester has so wisely said, and with his sane words we may conclude the present portion of our story: "Some people talk about the 'fairy-tales of Science.' There never was a more inappropriate phrase; it is altogether wrong to speak of fairy-tales having anything to do with Science. The wonderful things which

Science reveals to us are altogether remote from fairy-tales, for in regard to the tales of Science you can test what you are told, you can see the things of which I speak, you can ascertain the truth of what is asserted. That is the great pleasure of this study; one knows that the things one examines, however astounding and incredible they seem, really exist, and are not mere imagination or fancy."

Having thus directed attention at some length to a few of the salient features concerning animals, past and present, their lives and habits, forms and structures generally, their economic value, and the pleasure and profit to be derived from a study of them, we now proceed to briefly enumerate the classification, etc., of our British species.

**Classification of Animals, from Aristotle to To-day.**—Animals (which, as has already been shown in our opening pages, come under the head of Zoology) are divided into two groups, known as Vertebrates and Invertebrates. Vertebrates constitute those kinds of animals which possess a backbone, whilst Invertebrates comprise those animals without a backbone. It is a remarkable testimony to the memory of the great Greek philosopher Aristotle that his system of placing Zoology on a scientific basis is largely followed to-day. When it is remembered that this man—considered by many as the greatest and most truly scientific man the world has ever produced—lived in 384-322 B.C., it will be recognised what a colossal brain Aristotle must have possessed. To wrestle with a subject so vast and complex, and to successfully *originate* a scheme so important, was indeed a monumental task, and it speaks much for the Greek philosopher's marvellous intellect that not until about 1492-1555 was any further practical work carried out in regard to continuing the good deeds which Aristotle had accomplished so long before. In 1492 Wotton took up the classification of Aristotle, and, as a result of his own observations, enlarged upon it. Gesner, a Swiss professor, also worked at the same subject from 1516 to 1565, and John Ray, an Englishman, from 1628 to 1705 also laid us under a great obligation as a result of his painstaking labours. It was left, however, for the great Swedish naturalist Karl von Linné,

better known as Linnæus, to found our modern classification of animals and plants, and from 1707 until 1778 he accomplished a remarkable work as collector, writer, scientist, explorer, and delineator of animal classification and character, such as no other man has ever attained. Not only did Linnæus classify animals and plants, for he introduced the system of giving unto each a generic and specific Latin name. Many people often ask me of what use is it for animals and plants to have Latin names. They find it difficult, they say, to understand correctly, why English names will not suffice, and why it is necessary that long-sounding Latin should be employed. Professor Ainsworth Davis, in his great work "The Natural History of Animals" (to which we owe a note of indebtedness for much of the afore- and after-mentioned data), very lucidly explains this matter as follows: "We find living in Britain, for example, three kinds or species of Hare-like animals, all belonging to the genus *Lepus*, and called in popular language Rabbit, Hare and Alpine or Irish Hare. The double scientific names of these are respectively, *Lepus cuniculus*, *Lepus timidus*, and *Lepus variabilis*. The utility of such names is obvious, for if in recording observation on, say, the Rabbit, we speak of it as *Lepus cuniculus*, a Zoologist of any nationality whatsoever will know to what animal we are referring, while merely to employ the popular name might lead to great confusion. It will be noticed that the first or generic name is comparable to a surname, while the second or specific name may similarly be compared to a Christian name. The generic name is placed first merely as a matter of convenience, just as in an official list of human beings, such as a list of voters, it is found more convenient to give first place to the surname. By universal consent, scientific names are almost entirely taken from the dead languages, Latin and Greek, as these are studied by all civilised nations. Unfortunately, many such names are clumsy, and some are barbarous mixtures of Latin and Greek; but in spite of this, the system is a good one."

Since the time of Linnæus great progress has been made in the classification of animals. Cuvier, the Frenchman, propounded an important scheme (1769-1832), which, shortly





stated, was that different groups of animals bear relationship with one another, like the branches of a tree. Then, as a result of more accurate observation and research, it came to be recognised that in this great tree of life mapped out for us by Cuvier the large branches represented the large groups, their subdivisions the smaller groups, and the leaves individuals. Careful study of extinct animals has resulted in much support being accorded to this system, whilst Von Baer in 1792-1876 aided considerably the perfecting of the system by studying the zoological section of Embryology. Then came Charles Darwin, Huxley, and Wallace, the latter still happily among us, and the results of their wonderful labours enable us to comprehend the meaning of this genealogical tree, and, as almost every intelligent person now knows and recognises, what was once a mystery is now clearly explained as an actual blood-relationship—the outcome of a process of Evolution.

To Professor Ainsworth Davis's colossal work of eight half-volumes I cordially commend my reader's attention. All the above vastly important facts are set forth with lucidity, and can be followed by the merest tyro in Zoology, and a host of other interesting matter is recorded which cannot fail to be of service to every naturalist.

All of us in our humble way may be of some service in unravelling still hidden mysteries, secrets of Nature still waiting to be revealed to us, and I say again let no young naturalist be discouraged. Work in plenty remains to be accomplished, and Nature extends to all a warm invitation to penetrate into her wild fastnesses and to unravel some of the biographies of her animal children. I have pointed out to you, then, that animals consist of Vertebrates and Invertebrates, and I have told you the distinguishing characteristics. Let us follow the subject farther. British Vertebrates are divided up into the following classes:

### **Vertebrate Classification :**

- I. MAMMALS (examples: Bats, Hedgehogs, Moles, Foxes, Stoats, Squirrels, Rats, Mice, Rabbits, Deer, Whales, etc.).

- II. BIRDS (known to everyone).

III. REPTILES (Lizards and Snakes).

IV. AMPHIBIANS (Frogs, Toads and Newts).

V. FISHES (Salmon, Trout, Perch, etc.).

VI. PROTOCHORDATES (a low class of Vertebrates, few of which are familiar, and with which we shall not concern ourselves).

**Invertebrate Classification.**—We now come to the INVERTEBRATES, and these are divided up into a large number of groups, of which the following will serve our present purpose :

I. ARTHROPODA (or jointed-limbed animals, such as Crabs, Lobsters, Shrimps, Wood Lice, Spiders, Insects, etc.).

II. MOLLUSCA (or Shellfish, such as Squids and Cuttlefishes, Snails, Whelks, Winkles, Oysters, Mussels, Cockles, etc.).

III. ECHINODERMATA (such as Sea Urchins, Starfish, and Sea Cucumbers).

IV. POLYZOA (or Moss Animals).

V. ANNELIDA (or Segmented Worms, such as Earthworms, Sea Mice, Tube-dwelling Worms, Leeches, etc.).

VI. PLATYHELMINTHES (or Flat Worms).

VII. CŒLENTERATA (or Zoophytes, such as Sea Anemones, Corals and Jellyfishes).

VIII. PORIFERA (or Sponges).

IX. PROTOZOA (or Animalcules).

Several other groups of Invertebrates are recognised—indeed, there are some thirteen in all—but it is sufficient for our purpose to enumerate the nine important ones already set out. At the commencement of each chapter that follows we shall briefly survey the general characteristics of each class or group of animals with which we treat, and we need not therefore pursue the matter further here. We would, however, before passing on to our next chapter, dealing with Mammals, draw attention to the several photographs that illustrate this opening essay, which are all set out in scientific sequence on the lines which we have explained in our last few pages. These will enable the young reader to more clearly follow our written descriptions.

# PART I

## BRITISH VERTEBRATES

### CHAPTER II

#### Class I.—MAMMALS

**I**N the lists set out in the concluding pages of our last chapter it will have been observed that Mammals are placed right at the head of the Vertebrates. I have already explained what constitutes a Vertebrate—namely, an animal possessing a backbone—and I will now concisely state the general distinguishing characteristics of a Mammal, with which animals we are directly concerned in this second chapter.

It is remarkable to notice how few people indeed outside the domain of science know anything at all about Vertebrates and Invertebrates, of Mammals and Amphibians, and so on. Even the most elementary truths are unknown. Most people seem to consider that an animal is a creature possessing four legs—namely, a Quadruped—such as a Dog, Cat, Tiger, Lion, Fox, Horse, Cow, Rat, Rabbit, etc. ; but few realise, or anticipate, that Birds, Fish, Reptiles, Frogs, Toads, Crabs, Lobsters, Spiders, Insects, Snails, Whelks, Winkles, Sea Urchins, Starfish, etc., are all animals, and come under the great zoological section into which Biology—the science of life—is divided, as already shown in our last chapter. I often speak to people, for instance, about Vertebrates and Invertebrates, of Mammals, etc., and am astounded very often at the amount of ignorance and misconception that prevails concerning what the animals coming under these headings really are.

“Well, what is a Mammal? Tell me, please,” is very frequently the kind of question I am asked to answer—the extra-



OTTERS  
(*Lutra vulgaris*)



ordinary riddle I am often called upon to solve. I usually reply: "You, sir, belong to the Mammalia, and are therefore a Mammal yourself." Shortly stated, a Mammal belongs to the highest group of the Vertebrate or Back-boned animals; a Mammal is characterised by the possession of hair and milk glands, which belong to the skin.

Mammals suckle their young, like a human mother does her baby. Mammals (with very few exceptions) do not lay eggs, but produce their young alive. Even the Whales and Porpoises—which are Mammals, and not fish, as is so erroneously supposed—do this, and in many structural and other features Mammals greatly resemble, and in many cases are practically similar to, Man, the highest of them all. The skeleton of a Mammal is typical in many ways to that of you and me; the digestive organs, the circulatory organs, the respiratory organs, the nervous system, etc., are in many respects similar to those possessed by mankind.

Unlike other kinds of animals, Mammals, as has been stated, suckle their young, feeding them upon milk, which is acknowledged to be so nutritious. Not only this, for Mammals are most attentive to their young, and present many pleasing traits in their characters, about which we shall speak as we come to consider the biographies of individual species.

Having thus shown what constitutes a Mammal, we may now proceed to set out the six Orders into which our British species are divided:

First comes the Order Chiroptera, containing the Bats.

Second comes the Order Insectivora, containing the Hedgehog, Mole, etc.

Third comes the Order Carnivora, containing the Wild Cat, Fox, Stoat, Weasel, etc.

Fourth comes the Order Rodentia, containing the Squirrel, Dormouse, Rats, Mice, Voles, Hares, Rabbits, etc.

Fifth comes the Order Ungulata, containing the Deer.

Sixth comes the Order Cetacea, containing the Whales and Porpoises.

Bats are the only Mammals which inhabit our country who possess the power of flight, and, as will be observed, they are accorded pride of place at the head of the British Mammalia. Many people to whom I have pointed out this simple and yet

little-known fact have evinced surprise that our night-flying friend should occupy such a prominent position among such highly intelligent and wonderful animals as these Mammals are; yet, as we shall hope to show very soon, these winged creatures are most remarkable in many ways.

Strictly speaking, we possess very few four-footed animals in the British Isles, and several of them are most difficult to study. Some, like the Bats (almost, but not exclusively, as we shall presently see), the Badger, the Fox, the Hedgehog, and others, are nocturnal in their habits, and it is with difficulty that observations can be made upon them. Others, as the Squirrel, the Rabbit, the Hare, and so on, are diurnal; but their swiftness of foot and the manner in which they contrive to hide themselves are not conducive to close or continuous study of them. Some of these Mammals, like the Mole, the Rabbit, and the Fox, live, to a very great extent, underground; others, like the Whales and Porpoises, inhabit the ocean, and only show themselves on rare occasions at the surface of the water.

If our work was not restricted to animals inhabiting the British Isles, several other Orders of Mammals, unrepresented in our list already set out on p. 53, would have to be included; but it will suffice for us to mention that only two Orders would appear before the Order Chiroptera, or Bats—namely, the Primates (for example, Man, Apes, and Monkeys), and the Lemuroidea, or Lemurs.

Man, you will observe, finds a place among the Primates, and he is distinguished from the other animals included in the Order by his vastly superior mental powers. Beyond this most important distinguishing characteristic, Man, as Professor Ainsworth Davis tell us, "is the only Mammal to which the erect posture is easy and habitual, and we accordingly find that the lower limbs are specially modified with a view to the maintenance of this position. And as compared with the highest Apes, the human upper limbs are comparatively short, and adapted to perform the most delicate manipulations. Although the differences between the different races of mankind are well-marked, all are now regarded as having sprung from a common stock, and as belonging to the same genus,

*Homo*, and the same species, *Sapiens*. The scientific name for Man, regarded as an animal, is therefore *Homo sapiens*."

The scope of the present work does not enable us to follow this subject of classification farther, but it is as well that the young naturalist should know a few elementary facts concerning his own position in the world of animal life, as it will undoubtedly enable him to comprehend and understand more clearly the places occupied by these wild creatures, who are in many respects so nearly related to him. We now reach the first Order of Mammals set out in our list—namely, the Chiroptera, or Bats.

#### Order I.—CHIROPTERA, OR BATS

A great deal of misunderstanding exists as to the exact position occupied by these interesting creatures in the world of animal life. It will be our aim, therefore, in the succeeding pages to point out their general characteristics and salient features. I am of opinion that closer investigation into the lives and habits of our British Bats would reveal a number of interesting and unknown facts, and the young Nature student would do well to take up this branch of study, and so make himself an authority on our Flying Mammals.

The Order to which Bats belong—namely, the Chiroptera—is split up into two sections, one containing the Fruit-Eating species, and the other the Insect-Eaters. We have no Fruit-Eating Bats in this country, these animals (including the so-called Flying Foxes) being inhabitants of Australia, the South Sea Islands, and other countries. All our British species, then, are insectivorous, or Insect-Eaters. This being so, it is safe to assert that they are of distinct service in ridding us of myriads of insects which populate the air at nightfall, and it is astonishing sometimes to observe the large insects which fall a prey to their cunning. It is a mistaken notion, however, to conclude that all Bats are strictly nocturnal in their habits, for I have seen the Pipistrelle flying about quite happy and contented in a Sussex lane at midday, and have also known one of the larger kinds to have a battle royal in mid-air during the daytime with a male Stag Beetle.



Large Moths are preyed upon very largely by Bats, and I knew of one particular individual who repaired every evening to a porch to enjoy his meal. Every morning the wings and other discarded portions of Moths' bodies were observed on the ground of the porch, and it was evidently a favourite feeding-place for a Bat which made its home in the neighbourhood.

Country people still call these interesting Mammals Flitter Mice; but they have no close relationship to Mice, as the list of Mammals set out on p. 53 shows, they being more nearly related to the Insectivora, or Hedgehogs, Moles, Shrews, etc.

As has already been mentioned, these are our only Mammals possessing the powers of flight. Their endurance upon the wing, swiftness and softness of flight, sensitiveness of touch, and other characteristics, are quite remarkable. As a result of very careful observations that have been made, it has been proved that some kinds of Bats who come out for their night revels towards the evening hour are actually upon the wing without a moment's rest the whole night long, repairing to their homes in old hollow trees and other places towards the break of day. It seems difficult to comprehend how it is possible for a little animal such as this to perform such a wonderful feat. Its flying organs, however, differ altogether from those of our friends the birds, for, instead of feathers, we find a tough membrane extending between the body and limbs, and very often the tail. By means of long and slender fingers the Bat is enabled to spread out the membrane and keep it extended. It also possesses a strong curved claw on its thumb, which aids it to catch hold of an object when resting with its head downwards. Bats almost always sleep in this extraordinary position. When upon the ground this animal gives one a very poor impression of its wonderful wing stretch or agility when in the air. When its membranous wings are folded up, and the animal contrives to shuffle along, it reminds one of a poor old man toddling as best he can in his declining years. These are vicious little beasties, too, and snap at one with no uncertainty if teased. When crawling along a table or other object with wings closed, and then

suddenly extending them, the effect is very startling, the wings opening like an umbrella, and being ribbed somewhat after the manner of that most useful article.

Bats have small but bright eyes. They are, however, such extremely sensitive creatures that sight is of little account to them in their insect-hunting expeditions. They have long, sensitive ears, and in many instances curious leaf-like outgrowths on the nose are also present. The many sharp-pointed teeth enable Bats to snap at and tear to pieces any unwary insect with which they come into contact. These animals coming under the Mammalia, of course suckle their young, the mammary glands being situated on the breast. Even to-day, when so many books are published dealing with wild creatures, I meet people who ask me whether Bats do or do not lay eggs. It is, therefore, necessary to state that the Bat is a Mammal, and produces its young alive. The different species vary, but one, or at the most two, young are born in early Summer. It always strikes me that Bats are very wild, angry, ill-tempered animals, and I have known of an instance of a number of them taken from the roof of an old country house which were all put in a large box. There were, if my memory serves me correctly, some two or three hundred of the irate creatures, and they not only smelled dreadfully, but fought and squealed and tumbled over one another in a most extraordinary manner. These are gregarious animals to a very great extent, and large numbers of them are often found congregated together. They seem to huddle together on occasions in a homogeneous mass, as it were, and it is a weird sight to see them thus, and difficult to know exactly how many of them there are. They resort to the hollows of old trees, the roofs of old houses, barns, ruins, ivy-covered walls, and other similar places of seclusion.

They are badly infested with parasites, and even the smallest species we have—namely, the *Pipistrelle*—I have seen absolutely infested with small mites, which must make the life of the little *Pipistrelle* the reverse of pleasant.

Whilst their usefulness as insect-eaters is unquestioned, Bats appear to possess very few enemies indeed, so that there

is little need to emphasize their good deeds. They do not, so far as I am aware, do any harm excepting when on occasions their habit of taking possession of the roofs of country houses results in a nuisance by means of the stench which follows in their wake, or their scramblings to and fro, disturbing the peace in the silent watches of the night.

We may now briefly consider the chief features of our commoner British species.

**Noctule Bat.**—This is our largest British Bat, and for this reason is often referred to as the Great Bat. It measures about 5 inches from head to tail, and is light yellowish-brown in colour. The insect-eating Bats are, it should be stated, divided into two families, known as the *Vespertilionidæ* or True Bats, and the *Rhinolophidæ*, or Leaf-Nosed Bats. The Noctule, the Pipistrelle, the Serotine, Natterer's, Daubenton's, the Whiskered, Long-Eared, and Barbastelle all belong to the True Bats; whilst only two forms are found in Europe north of the Alps claiming kinship with the Leaf-Nosed family, and both of these inhabit our own country—namely, the Greater and Lesser Horseshoes.

In the True Bats the nose is more simple in form than in the other family, the species coming under the latter having curious outgrowths from the nose, which, it is believed, serve the purpose of special touch organs. The Noctule is a powerful flier, and resorts to hollow trees. The young naturalist possessed of keen olfactory organs may discover the presence of this Bat by the foetid odour it gives out. Some Bats are solitary, others are found in pairs; the greater number are found in colonies. The Noctule comes under the second heading. An examination of this large Bat will reveal that the membrane commences above the ankle, and that it possesses a line of hair along the forearm.

**Pipistrelle Bat.**—This is our commonest species, and one with which everyone living in the country is more or less acquainted by sight, as the little animal darts to and fro just over one's head in the gathering gloom. These are strange folk on occasions, and I have known one seize a baited hook towards nightfall as the line was being cast into the water. A curious

catch indeed for the ardent Waltonian! The fur is reddish-brown in colour outside, but examination will show that it becomes darker towards the skin; and, excepting for a little black hair in the region of the eye, the face is naked. Unlike the Noctule last described, the membrane of this common species commences *below* the ankle. The ears bear notches on their margins, and are prominently lobed. Not only will this species live on an insect diet, for in captivity it readily devours flesh. It does not possess the lengthy hibernating period of other species, and some individuals may be observed practically throughout the whole year. The large mouths that Bats possess enable them to collect an abundance of food, and after insect-hunting all night one can imagine the toll taken from the insect denizens of the air. Truly these weird Mammals are farmers' friends; and although we are not the fortunate possessors of a large number of species, we have sufficient to engage the close attention of the young Mammal student, and much remains to be learned about even the few kinds which perform such good and useful work among us.

The head and body of the Pipistrelle measure about  $1\frac{2}{3}$  inches; the tail somewhat less.

**Serotine Bat.**—This is not a very common British species, but is probably often confounded with the Noctule, or Great Bat, already described. It is about the same size, but in colour is dark smoky-brown above and yellowish-brown to yellowish-white below. The Serotine, as its name implies, comes forth on its night prowls late in the evening. It is a slower flyer than other members belonging to the same Genus, and flutters a good deal during the course of its aerial evolutions. It is interesting to notice that most species coming under the Genus *Vesperugo* produce two young ones at a birth. The present member, however, has only one young one at a time. It resorts to gardens, orchards, and the neighbourhood of woodland, keeping to the seclusion of hollow trees during the daytime. The Serotine is a great lover of warm, fine Summer evenings, and rarely takes to flight when the weather is cold or stormy.

**Natterer's Bat.**—This Bat possesses very long and thick fur of a dark brown colour above, tipped with reddish. Underneath the colour becomes darker at the base and white on the tips. What is known as the interfemoral membrane is *fringed*, and this is a great distinguishing characteristic. By this fringe alone it is possible to identify this species from any of the others in the same Genus. It is often called the Reddish-Grey Bat, and its light-tipped underparts give it quite a distinct appearance when flying overhead. It does not possess the quick flight of the Pipistrelle, the movements being less jerky and more sustained. The roofs of buildings are mostly resorted to by this Bat as a hiding-place, and large numbers are sometimes found congregated together. It also inhabits caverns. The head and body measure about  $1\frac{1}{2}$  inches, and the tail the same.

**Daubenton's Bat.**—The wings of this species arise from the sides of the feet, immediately underneath the ankle. The colour is brown on the upper surface, and dirty white below. The head and body measure about  $1\frac{9}{10}$  inches, whilst the tail is about  $1\frac{3}{4}$  inches long. This Bat is a great lover of the neighbourhood of water, and is the species which the disciple of Walton mostly observes when he is fishing in the fast-gathering gloom. It dexterously skims over the surface of the water, and has, indeed, been seen actually dipping into the liquid element much after the manner of the Swallow. By carrying out these interesting movements Daubenton's Bat procures an abundance of insect food. It resorts to trees as a temporary hiding-place, but when it retires for hibernating purposes in Winter, will be found in old disused buildings, either above or below ground.

**Whiskered Bat.**—The membranous wings of this species proceed from the base of the outer toe. Add to this the presence of numerous long hairs upon the face, which cover the upper lip—hence its English name of Whiskered—and one may at once identify it from any other British representative of this interesting Order. It has ears as long as its head, and the fur above is brown in colour and greyish below. The head and body measure about  $1\frac{1}{2}$  inches; the tail

1 $\frac{2}{3}$  inches. This is a solitary species, and possesses a flight very much like that of the Pipistrelle. It frequents hollow trees, the roofs of buildings, caverns, and chalk caves. Similar to Daubenton's Bat, the present species also resorts to water. At the end of June or early in July the one young one is born.

**Long-Eared Bat.**—This Bat well deserves the name of Long-Eared or Rabbit-Eared, for its ears are as long almost as the head and body. The soft fur is brown in colour, generally fawn or light brown above, and whitish below. The head and body measure about 1 $\frac{3}{4}$  inches; the tail about the same. It is a common inhabitant of our country, and has even been seen hawking amidst the busy hum of Cheapside in the heart of the Metropolis. This is all the more extraordinary when it is borne in mind that this Bat is a great lover of the open country, having a decided partiality for trees and plantations. It is a strong and rapid flyer, and can rise with ease from the ground. That keen observer of wild life Macgillivray states that "its voice is a low chirping squeak; and when teased or frightened, it utters a querulous note, like the wailing of a very young child." It possesses a long Winter period of hibernation, and is only to be seen from late Spring until early Autumn. Seen for the first time, with its long ears extended to their fullest extent, this fine Bat cannot fail to attract attention, these appendages being held erect during flight. It inhabits old buildings, church-towers, rocks, and other places.

**Barbastelle Bat.**—This species belongs to a different Genus to the last-named, and is comparatively rare. We ought not, perhaps, to have accorded it a place in a work avowedly devoted to our commoner kinds of animals; but this proposal would, if carried out, have considerably reduced our list of British Bats, and hence two or three of the rarer kinds are included.

An interesting point arises from the fact of this species having been observed as far North as Cumberland—namely, that Bats, like Birds, migrate either occasionally or at set times.

The deep black and soft fur of the Barbastelle is tipped with indistinct greyish. The head and body measure about 1 $\frac{2}{3}$  inches; the tail about the same.

This is not a robust animal, and Autumn's lease has not long started to run out when it becomes torpid, and seeks some congenial sleeping-place for the Winter months. It is a more rapid and higher flyer than the species last under review; it makes its appearance early in the evening.

**Greater Horseshoe Bat.**—Belonging to the *Rhinolophida*, or Leaf-Nosed Bats, the present species is particularly interesting by reason of the curious leaf-like processes of skin which are present around the nostrils. This nose-leaf, as it is called, is of a highly sensitive nature as an organ of perception, and is in itself sufficient to at once identify this Bat with the family to which it belongs. Indeed, the Leaf-Nosed Bats are to be regarded as the most highly organised and specialised representatives of the insect-eating division of the Order. The Greater Horseshoe is about  $2\frac{1}{2}$  inches long on its head and body, whilst the tail measures  $1\frac{1}{2}$  inches. Reddish-brown is the general colour above, with a tinge of greyish; underneath it is pale grey or whitish. It is mostly restricted to the Southern parts of England, and one should search for it around old castles, churches, and caves. Mr. R. Lydekker records the interesting fact that this Bat is "especially common in the well-known cave of Kent's Hole, near Torquay, of which it has probably been an inhabitant ever since the age of the Mammoth, since its fossilised remains have been found there in association with those of the latter and other extinct animals. It may be mentioned that on the Continent this Bat is also very generally found in caves, sometimes in enormous numbers, and, what is more remarkable, usually in colonies composed entirely of either male or female individuals. This Bat is not recorded by Thompson from Ireland, and is probably unknown there."

This species appears late in the evening. It is a high flyer, and exhibits a marked partiality for trees or their vicinity.

**Lesser Horseshoe Bat.**—This is a powerful Bat upon the wing, and is said to be a higher flyer than the last-named. It does not, however, show the same preference for trees. It is light brown in colour above, and light greyish-brown below. The head and body measure about  $1\frac{1}{2}$  inches;



LEOPARD BAT ON BRAC



A PAIR OF HEDGEHOG





COMMON SHREW

the tail  $1\frac{1}{2}$  inches. It inhabits caves and buildings, and, like the Greater species, is mostly found in Southern England. Unlike its larger relative, however, it is also found in the Emerald Isle.

### Order II.—INSECTIVORA

This is a small Mammalian Order, containing as it does the Hedgehog, Mole, and the three Shrews. We will consider their biographies in the order named.

**Hedgehog.**—This interesting animal is more plentiful than is generally supposed, and on a small estate of my acquaintance over three hundred were trapped in twelve months! Being mostly nocturnal in its habits, it is not often one comes across a Hedgehog. I have occasionally during my woodland wanderings lighted upon the animal. At the slightest alarm the Hedgehog will curl into a round prickly ball, and his spines well protect him. It is remarkable to notice that, although such a shy, timid creature in a state of nature, the Hedgehog, when kept as a pet, soon becomes quite docile. It is really difficult, however, to keep the sagacious creature if it be given its liberty in a garden, for it possesses a knack of escaping in a truly bewildering manner. One that I managed to keep for a few days a year or two ago was soon missing, and this in spite of the fact that the animal had become quite tame, and that the garden was securely walled in with a high fence.

Gamekeepers do not regard this animal with favour, and I feel convinced, after what I have seen with my own eyes, that there is little doubt the Hedgehog does do harm in game preserves by getting among the eggs of Partridges and Pheasants, and also by attacking young birds. It is further accused, and I think rightly, of attacking the inmates of fowl-houses. On the other hand, its dietary is made up for the most part of various Insects and Worms, Frogs, Toads, Slugs, Snails, etc.—and although it perpetrates harm, the balance seems to me to be on the right side. This animal is about 10 inches in length, and possesses short, small legs and feet. It is an interesting sight to watch a Hedgehog prowling about the

countryside as the sagacious creature comes ambling along in a very happy and contented manner. As it proceeds, it will be observed to poke its pig-like nose into all manner of places, and will even do battle with an Adder. Mr. J. G. Millais has described in graphic words an encounter that his keeper witnessed on one occasion. The clever ruse on the part of the Hedgehog is carried out in this way : It attracts the attention of the Snake, and excites the latter to anger. Thereupon the reptile prepares to strike, and, before one has time to realise it, the Adder has sprung towards the Hedgehog. The last-named, however, is well prepared for the attack, as, having attracted the Snake's attention, it quickly rolls itself into a ball ; and when the Adder strikes its spiny outer covering with a sickening thud, it meets instant death ! Slowly the crafty Hedgepig unrolls its body, and, finding its prey close beside it, partakes of a meal without more ado. The more the animal is irritated and angered, the more firmly it contracts its body, and the more stiff and sharp does its outer covering become. Indeed, very few animals seem capable of attacking it with any measure of success, and geology teaches us that this Mammal family is one of the oldest we have. We see it to-day practically in the same form as in the Miocene Age ; and when one remembers how well guarded it is and immune from the attacks of other creatures, it is small wonder that it has not undergone any radical change in its general form and structure.

During the daytime it rolls itself into a ball and rests. It dearly loves a hedge-bottom containing a profusion of leaves, but my own observations certainly lead me to conclude that it is very partial to the neighbourhood of woodland and thickets.

From two to four young ones are produced in early Summer, and these are blind at birth, and bear at first soft white spines. These latter, however, soon harden. During the Winter the Hedgehog remains in a torpid state, and does not feed. It makes a cosy resting-place in some sheltered ditch under a hedge, or at the bole of a tree, and the rigours of King Frost have no effect upon it. I have found the animal soundly

asleep at such season, and apparently lifeless. The poor creature is profusely infested with parasites, which must cause it an amount of irritation difficult to imagine.

**Mole.**—Not less interesting than the last-named, the Mole is an ingenious dweller below ground. It is a remarkable fact that this little Mammal contrives to live in rich pastures, where the soil admirably suits its tunnellings, and where an abundance of Earthworms and other creatures enable it to procure food without a great deal of hunting. This animal differs from the Shrews—next to be described—by being solely subterranean in its habits, as well, of course, by its superior size. The small pointed head; plump little body; minute eyes and ears; soft fur (which can be brushed equally well either way, a very wonderful provision of Nature, when one considers how important this is when the Mole is burrowing underground); the number of small, sharp teeth; and the very extraordinary structure of the fore-limbs, are characteristics worthy of attention. These latter limbs have become vastly different from the hind-limbs, which have undergone practically little change. They bear upon them five strong claws, and what is known as a special “sesamoid” bone, making in reality six “fingers” upon a large “hand.” It is wonderful with what alacrity the Mole can disappear below ground when it happens to be caught on the surface. Before one has time to realise it almost, the crafty creature has buried its head low down in the earth, worked assiduously with its strong spadelike claws, and in less time than it takes to tell the story, presto! it is gone. I remember seeing a Mole above ground on one occasion. It was in the early morning, a fine time of day to catch some animals astir that are rarely seen at any other time. I chanced to be a few yards only from the animal, and I ran immediately I perceived it. I was too late, however, for when I reached the spot the Mole had dug its way into the earth, and, try how I would, I could not locate it. It is rare to catch a Mole for long above ground. That it does come out at night seems to be generally recognised, but it is almost exclusively a dweller underground. It is able to force its body through the soil in a wonderful way, and although I have frequently seen the earth

move as the animal propelled itself along, I have found it exceedingly difficult to definitely locate its exact position. Its scent powers are very great, and upon these it relies to a large extent when on its foraging expeditions. Although it has been stated by some observers that during the Winter this animal digs below the frost-line, I noticed not long since, when the ground was heavily frost-bound, that a number of large hillocks of rich loamy soil had been cast up during the night-time. Is it not wonderful to reflect upon the enormous strength of this small creature, not only in being able to force its way through the compact soil, but also in throwing up such large and well-formed "Mole-hills" during severe frost?

Although the animal burrows and tunnels and throws up numerous hillocks of earth in the fields it frequents, each family has a regular homestead—a sort of central citadel, as it were. This is a remarkable dwelling-place, consisting of a number of well-constructed galleries ingeniously hewn out of the earth, with a living chamber near the surface. From the Mole citadel various tunnels lead off, and it is along one of these that the animals set out upon their feeding expeditions. Besides Earthworms, the Mole devours countless numbers of the very injurious larva of the Crane Fly, and in this way performs an amount of good that cannot be overestimated. Beyond this, it will eat Mice, Shrews, small Reptiles and Frogs. It is a thirsty animal, too, partly owing, no doubt, to the nature of its food and its untiring energy—so much so, indeed, that it resorts to the ingenious device of sinking deep shafts for water. It can swim, but unless driven to it by stress of circumstances rarely enters the water. Its worst enemy—next to Man—is the crafty little Weasel.

In the breeding season combats often take place among these small Mammal folk. There are fewer females than males, and the latter fight desperately during the pairing season for the possession of a partner.

The nest must not be confused with the central citadel, for, having been used, it is deserted. It is constructed beneath a hillock of earth. From five to seven young ones constitute

the litter, and these are born about July. They are at first pale brown or grey, with a light pink snout.

The glossy black and soft fur of the adult Mole is much sought after for making up into waistcoats, caps, and other articles of apparel, and in many parts of the country professional Mole-catchers even to-day contrive to make a living by trapping these ingenious and interesting little tenants of the countryside. Varieties of the Mole are not uncommon, and grey, yellow and white specimens are constantly being recorded.

**Common Shrew.**—The Shrews are to be numbered among the smallest Mammals we possess, the next species on our list—the Lesser Shrew—being, indeed, the smallest Mammal in the British Isles, whilst the Eastern Long-tailed Shrew is the smallest Mammal known in the world. Generally, Shrews are Mouse-like animals, but have distinguishing characteristics in a long, pointed head and nose; a slender jaw, containing sharp red-tipped teeth; close, rounded ears; a whiskered snout; and a musky smell. Mice, moreover, come under the Rodentia, as already set out, and the peculiarly sensitive snout of the Shrews at once shows the near relationship they bear to the Mole, previously described. Indeed, the Shrews are connected with the latter by various kinds of Mole-Shrews. Shrews are active, engaging little animals; they possess sharp powers of hearing, and are bold and fearless in disposition. Yet it is remarkable to notice that, although wonderfully hardy (being found in Northern regions and elsewhere), it is difficult to keep them in captivity; they are the reverse of docile and confiding, and these wee beasties are easily frightened to death! The musky odour exhaled by means of glands near their armpits is undoubtedly a source of protection against various enemies, but, in spite of this, Owls, Moles, and Weasels prey upon them, unperturbed by the smell emitted.

Many curious superstitions are still rife with regard to this animal, and one instance will suffice. In a work entitled "Historie of Four-footed Beastes," issued in London in 1607, the author, the Rev. Edward Topsell, writes of the Shrew that

“it is a ravening beaste, feigning itself gentle and tame, but, being touched, it biteth deeply and poysoneth deadly. It beareth a cruel minde, desiring to hurt anything, neither is there any creature that it loveth, or it loveth him, because it is feared of all.”

The Common Shrew is about 3 inches in length, and is widely distributed throughout England and Scotland. It does not occur in Ireland. The breeding season is early Spring. From five to eight young ones are brought forth in late Summer, the nest being usually found in a depression of the ground. That accurate observer of animal life, Mr. J. E. Harting, however, states that sometimes the nest is to be located in a clover-field, and consists of a ball-shaped structure similar to that of the Harvest Mouse. This is a nocturnal animal, like the Mole; but the food is procured above, and not below, ground. Unlike the afore-mentioned, too, the Shrew goes into a torpid condition in Winter, and the rise or fall of the temperature does not affect the sound little slumberer.

In colour the Common species is generally reddish above and grey below. Beyond the distinguishing characteristics of the Shrews already referred to, the present member has a short, bristly, four-sided tail, which is a sure means of identification.

**Lesser Shrew.**—This animal, as its name implies, is smaller than the last-named species; indeed, as has already been mentioned, it is our smallest British Mammal. The general colour is brown above and white below. It measures about 2 inches, excluding the tail, and possesses extremely minute teeth—so much so that their presence can only be detected through a lens. Although not such a common species as its relative last described, it has a wide distribution in our country, and appears in Ireland. In its general habits it resembles its larger relative, but distinguishing structural characteristics are the proportionately short fore-arm and foot, and the third upper incisor is not longer than the canine.

**Water Shrew.**—This interesting Mammal belongs to a different Genus to the two species last under review. Whilst they claim kinship with the Genus *Sorex*, the present animal



COMMON FOX





is the sole representative we have of the Genus *Crossopus*. As its name implies, it is an aquatic Shrew, taking up its abode in long, winding burrows. These it excavates in the banks of rivers, ponds, ditches, etc., and it is an active, engaging creature. It is an entertaining sight to watch the Water Shrew in search of food. It dives with ease and facility, and swims gracefully and silently. It is a rapid swimmer, too, and to have the good fortune to catch the animal at the bed of the water feeding is to be regarded as a red-letter day for the young naturalist. The food is made up of aquatic insects and their larvæ, as well as Crustaceans and Fresh-Water Snails. There seems little doubt that this Shrew will on occasions also partake of spawn and young fish, and even dead animals of various kinds. When seen under water the black-and-white coloration (subject, however, to great variation) appears greyish, this effect being caused by the small air-bubbles that adhere to its fur and give it a most curious appearance. The length of the head and body is about  $3\frac{1}{4}$  inches; the tail about 2 inches. The latter bears upon it stiff fringing white hairs. The feet are the same colour. The female is smaller than her mate, and brings forth a litter of from five to eight young ones in May. The nest is made at the extremity of a long burrow, and is composed of dry grass and moss. This is our largest British Shrew.

### Order III.—CARNIVORA

This is a much more important Order than the Insectivora, last under consideration, and we shall now make the acquaintance of a number of interesting animals deserving notice. First on our list is the Wild Cat.

**Wild Cat.**—This is a rare species with us to-day, and the young naturalist, for whom this book has primarily been written, is not likely to observe a genuine Wild Cat in its native condition. A few particulars concerning it may, however, be given. Quite recently a fine specimen was captured in the mountains of Argyllshire, and another one shot. From information that has reached me of this animal's depredations, it appears that Wild Cats are by no means extinct in the

Scottish Highlands, and whilst it is regarded as an unmitigated nuisance by gamekeepers and others in the North, it is pleasant to reflect that such an interesting member of the Carnivora still exists among us.

Dr. R. F. Scharff, in working out the Mammalian remains discovered in the Clare Caves, Ireland, not long since made the interesting announcement that he has identified amongst the remains those of a Wild Cat. Dr. Scharff states that, as a result of his studies, he is led to the conclusion that this animal has not been long extinct in Ireland, and that there is even a possibility that a few specimens may still be found in the more remote recesses of the Western districts. The most interesting part of the discovery, however, is that there is no doubt whatever that the Irish Wild Cat differed from the species still found in Scotland, and that it resembled, in fact, a Wild Cat peculiar to Southern Europe and Northern Africa. Beyond this its tail was not bushy, but pointed like that of our well-known domestic Cat.

The general colour of the true *Felis catus* is yellowish-grey. Along the back there is a dark interrupted stripe, two dusky bands on the cheeks, a number of obscure transverse stripes on the body and limbs, a thick bushy tail, ringed and tipped with black. The fur is soft and long, and the body length of the male is nearly 3 feet. The female is the smaller of the two, and is usually paler in colour. This is the sole remaining representative we have in Britain to-day of the feline family (Genus *Felis*), and yet it is remarkable to notice that in the bygone ages this fine Mammal was widely distributed in our country. Its remains have been discovered in a number of Southern and Midland Counties, in company with those of such animals as Hippopotami, Rhinoceri, Mammoths, and other similar creatures. It seems to have lingered in the Lake District of Cumberland as late as 1795, although stray specimens (real and so-called) have been recorded even as recently as 1871. These records, however, are said to be based on large feral specimens of our own Domestic Cat. This I can quite understand in view of the savage Domestic Cats that I have myself seen trapped on a small estate within twenty miles of London.

Many of these (and I have known as many as forty trapped in one season) were sandy-coloured specimens, and one particular example I shall not readily forget. Unfortunately, I did not take the measurements (the animal being in a high state of decomposition), but I remember very well sighting her body in the undergrowth, and thinking at first that it was a Collie Dog! Is it generally recognised that sandy-coloured cats are the worst-poachers? That our own Domestic Cats do possess keen poaching instincts goes without saying, and in the London parks and squares and elsewhere many young and even adult birds fall a prey to their crafty stalking.

This is a savage, strong, and active animal—so much so that it is to-day regarded as the only ferocious Mammal left to us. Its ferocity is increased when it is wounded, and an angry Wild Cat is no mean antagonist for a man to tackle. It inhabits wooded and mountainous districts, and in some secluded retreat makes its lair. An impenetrable thicket, a hollow tree, or in a crevice of a rock, are favourite haunts, and in one of these situations it rears its young. The litter consists of five or six, and these are born during early Summer. The mother Cat is most solicitous for her offspring, and suckles them until such time as the kittens demand a change of diet. Then she brings them mice and birds, until eventually the young ones are strong enough to commence hunting for food on their own account. There seems to be a divergence of opinion as to whether our Domestic Cat is a direct descendant of *Felis catus*. The general impression appears to be that it is not, and one of our highest authorities on British Mammals states that the Caffre or Egyptian Cat (*Felis caffra*) of Northern Africa is the real progenitor of our own favourite "Pussy." Nevertheless, it is recognised that, at some time or other, Domestic Cats have interbred with the Wild Cat, and the number of tabbies that we observe among our domestic varieties to-day seems to bear out this view in a very marked manner.

**Fox.**—This well-known animal belongs to the same Genus as the Wolf—namely, the Genus *Canis*. It will interest the reader to know that, in Saxon and Norman times, and even as late as the twelfth century, Wolves were extremely

plentiful in this country. Indeed, in the sixteenth century these animals still flourished in Scotland, and it was not until well into the eighteenth century that the last one was recorded ! Whilst we have lost the Wolf (a statement that will probably cause a certain amount of relief to the reader), we still have a near relative in the person of the Fox (*Canis vulpes*), and a vastly interesting first-cousin he is.

When one rambles to any extent along the countryside and through the woodland, it is not an altogether uncommon occurrence to suddenly see darting stealthily in front of one a sagacious Fox, followed very shortly afterwards by the hounds and the huntsmen. On a recent occasion, too, I was considerably amused and interested by one particular animal cleverly evading its pursuers, so that it was not even "scented," and taking the same track away from its hunters as the latter had just pursued. Being so keenly interested in this clever piece of manœuvring, I stupidly forgot to give the "Tally-ho!" which brought showers of indignation and wrath from the hunt when they heard of what I have above recorded.

Although, as I have said, it is not an uncommon sight to see the hunted Fox, it is, I believe, a rare occurrence to anyone but gamekeepers, who practically live in the "open"—or, at any rate, should do—to observe a pair of Foxes playing and skirmishing about on an open meadow, for all the world like a couple of Collie Dogs. Yet I had the pleasure of witnessing for over a quarter of an hour this entertaining sight on a certain bright morning. The wary animals walked slowly straight across a very large open field, every few yards sitting down on their haunches, and allowing a splendid view of them through my prism binoculars. The vixen was larger than the dog Fox, and her splendid bushy tail was shown off magnificently as she sat upon the fresh green grass of early Spring. As they sat and faced us, the pair made a fine study, and the white on the chest was very marked, and showed up prominently against their otherwise rich brown hair. What struck me very forcibly about this pleasant little entertainment in the natural history world was the fact that the two animals were surrounded by a great number of Starlings, Rooks, and other birds, and that the

latter did not seem in the least disturbed by their prowling visitors.

HAVING watched them at a distance of about 400 yards—the animals the whole time caressing one another and acting in a most playful and unsuspecting manner for some minutes, like unto two kittens—I pulled out my handkerchief and waved it, when, lo, presto! the ever-watchful creatures saw the signal and bounded out of sight in less time than it takes to tell the tale, to the evident discomfort of the birds in the vicinity.

The gamekeeper was my companion on this memorable occasion; he is still praying fervently for the huntsmen and their hounds, who, although they have been on the estate several times, have so far drawn nothing but a miserable “blank,” and now the hunting season is over the keeper has to content himself by “housing” the two animals and their forthcoming cubs for another summer, and those who have game preserves and fowl-houses need no reminding of what that means.

The really heartrending depredations of the Fox—that is, if one tries to rear game or keep poultry—are appalling. Whilst no doubt many records are somewhat far-fetched and inaccurate, I have myself known of thirty-six nearly full-grown Pheasants being killed by Foxes in a quarter of an hour, and not many years ago almost the whole of the Fowls on an estate near me were exterminated in the course of one night. The crafty and destructive animal seems to kill for killing sake. Certain it is that far more food is killed than can possibly be eaten. The creature seems to possess an insatiable lust for blood, and the authentic accounts which have come under my own notice in a restricted district are sufficient to convince me of the enormous amount of damage this animal perpetrates, especially on game-preserves and around the farmyard.

An instance of the audacity and extraordinary carrying powers of the cunning and sagacious Fox was recently brought to my notice. A pair of Mute Swans were kept upon a small lake in the vicinity of woodland, and great havoc had been wrought upon the estate by Foxes. The estate, however, is situate in the heart of a great Fox-hunting district, and the

"vermin" have to be preserved—so much so, indeed, that the poisoning of one by the means of strychnine resulted in a reward of £50 being offered for information which would lead to the arrest of the poisoner! To hark back to our story: one day the female Swan was missed, and a search made for her, but without success. A few days later, however, a shooting party located the body of the Swan in a small wood quite half a mile from the water where the pair of Swans were looked upon as monarchs of all they surveyed. An inspection of the body and the surroundings led the party to the inevitable conclusion that the bird had been seized by a Fox when snoozing by the lake at nightfall, and, taken unawares, was dragged by the Fox (or Foxes) to the seclusion of the wood, where the meal could be partaken of in quietude. Since the Drake lost his mate he resorted to most vicious attacks upon everyone who approached anywhere near him, even showing much resentment to the man whose duty it was to feed him! The latter was badly scarred about the body as a result of the bird's outburst of rage, and it was eventually decided to do away with him.

I am able, through the kindness of a valued correspondent in the North of England, Mr. C. H. Slaytor, Doncaster, to supplement my own notes upon the Fox by a series of first-hand observations. Mr. Slaytor has paid particular attention to the habits of Foxes, Badgers, Otters, and other Mammals, and he has been good enough, at my request, to send me much valuable information concerning them. Mr. Slaytor writes:

"When about fifteen years old a keeper, as a great treat, showed me a Fox-earth containing a litter of cubs. Contrary to general rule, he was a great admirer of them, and, as he told me, he would sooner a man got his Pheasants than his cubs; but I thought it was necessary to my existence to possess a cub, so, after a great deal of planning, one dark night, armed with a lantern, spade, and terrier, I went to the wood and found the earth, and put the terrier in for a guide to dig to. After some awfully hard work, I succeeded in coming to a cub worried by the dog, and then two more dead, and finally suc-

ceeded in getting two alive, after a great deal of scratching and spitting and much Fox bad language. Having got these in a bag, I landed safely home without anyone being any the wiser, and deposited my treasures in an old stable. My secret, however, leaked out, as I had to forage for food for my pets; and, finding it difficult to obtain, had to do as the vixen does—get an old hen. The end soon came, for I got into dreadful disgrace, and had to carry the cubs back to the wood and let them go. I did, however, get something—the head of one of the dead cubs, which I boiled and got the teeth out, some of which I kept until quite recently. That was my first intimate experience with the Fox family.

“Another time, in the Winter, I was walking down a hedge-side, when I found a very fine dog Fox caught by one claw in a trap. Of course, I wanted him, and to attain this end cut a strong stick and tied a piece of string to the end of it, and then tried to get it round his neck; but that was easier said than done, as he bit at everything that came near him; so I got another piece of stick and let him get it in his teeth, then slipped the noose over his head, pulled it tight, and had him fast, on the same principle of having a staff attached to the ring in a bull's nose. I then sprung the trap with my foot, and commenced my journey home across the fields. No acrobat ever put himself in such positions as did that old Fox, but time and patience landed him home. We had a little place underneath the granary steps in which we kept our eating potatoes. It had no hole that I knew of, so I thought this was the very spot for him. I got him safely in, and locked the door. My idea was to keep him until the hounds came, and then turn him loose. I gave him plenty of water and old hens, and all went well for two or three days; but one morning I went to feed him, and found the place empty. I then found that he had scratched a hole and escaped, and I never saw him again. Some little time afterwards, however, on coming in to dinner, I noticed a most peculiar smell in the kitchen, and asked what it was. The servant said she thought it was the potatoes. On getting some, on my plate, I did not think I was quite sure—they were as strong as a Fox-earth; but we had to throw away



all the potatoes that were stored in the Fox's erstwhile prison !  
Moral : never keep a Fox amongst eatables.

"The moorland Foxes are remarkable for their stoutness, most probably from their having to travel far in search of food. I remember once staying on the moors. I had at the time a very bad cold, and really felt poorly, so did not go to the meet. After dinner a man came in very excited, and said the hounds were running over the moor close to the house. The temptation was more than I could resist, so, running to the stable, I jumped on a horse and went, cold or no cold. I soon found the hounds, and by taking advantage of knowing the moors and the Fox-runs, I managed to see a lot of sport without having to ride fast. Towards the end I nicked in well in front of the hounds, watched them hunt up to some small enclosure, and get on to a bank covered with brushwood ; and, close to me, I saw something roll off the bank into the ditch. On riding up I found the Fox dead and perfectly stiff. The hounds came up on the scent, but would not touch him. Another time, in the same district, I saw them hunting two Foxes in a wood. They always kept close together, though sometimes one Fox would break cover, but on finding the hounds were not following him, would go back and join his mate. I thought this very curious, so managed to get close to them in one of their doublings in cover, and found it was a dog Fox with a vixen, the latter being heavy in cub. Eventually the hounds chopped the vixen in cover ; then her mate made straight for the open moor, and, after a run of nearly three hours, dropped dead in front of the hounds within a few yards of a wood. I happened to be one of the few fortunate ones that saw the finish, and got a pad, which I cured ; but the hair all came off, which I think plainly showed the state of the Fox. I understood the mask and brush were the same. Truly, as Thompson Seton, the American naturalist, says, 'The lives of wild animals end in a tragedy !'

"I knew a farmer who caught a Fox in a trap and put him in a little place in his barn. Next morning he went to look at him, and saw him stretched out apparently dead. He picked him up and threw him out in the barn, and at breakfast told his son to go and skin him. On the son going to the barn

he found that the Fox had disappeared, for he had only been shamming! Truly these are sagacious and cunning folk.

"A man who was working on the roof of a church told me that he once saw a Fox come running across the churchyard, and kept stopping to listen. Having apparently satisfied himself that the hounds were following, he jumped through a little window which was open into the pantry of the sexton's house; whereupon the hounds came up, hunted all round, but could find no trace of Mr. Fox. The man on the church roof kept his counsel, so, not finding anything, the hounds drew away. Shortly afterwards the Fox popped his head out of the window, and, finding the course clear, quietly dropped out, and went home, neither the sexton nor his wife being any the wiser for their visitor in the pantry.

"It is a curious thing, a Fox never touches anything near his earth when he has cubs. A year or two ago I knew of a litter of cubs in a Rabbit warren close to a farmhouse, and I often used to sit in the house with some glasses to watch them about six o'clock in the evening, and the vixen would lie about playing with her family. I have seen the vixen lie with the cubs jumping all over her, and within a yard or two little Rabbits skipping about; and later in the evening it was no uncommon sight, when the cubs were left alone, to see them chasing the young Rabbits; but as far as I know, they never killed one, though they could have done so quite easily. Their mother must have given very strict orders, and they must have been most obedient children. Many two-legged ones might get a useful lesson from them. One summer I saw some good-sized cubs and young Rabbits close together on a sunny afternoon. I could have killed a cub and a Rabbit at a shot, so near were they to each other.

"Some keepers found a Fox-earth, with cubs in, close to where they had their young Pheasants in coops, and one Saturday they tried to dig them out, but they could not find any. On Sunday morning, when the keeper on duty was letting the Pheasants out of the coops, he noticed a vixen lying on her stomach under a holly-bush, and behind her the cubs. On seeing her the keeper went to his house, about

*half a mile away, to get his gun. When he returned, he found a hundred of his young Pheasants dead, just nipped across the back, but no Fox. He went to the head-keeper, and they got all their men and dogs, and hunted all the surrounding woods, but never saw the Fox family either then or afterwards. If they had not interfered with her family, there seems little doubt that she would have left the Pheasants in peace.*

“A vixen had her cubs in a Rabbit-hole close to a farmhouse. When they got a nice size the farmer dug them out, and managed to catch three. These he tied up in the steam-house (where they cook potatoes for the pigs). Two of them he fastened with rope, and the third he tied up with a chain. In the night the vixen found them, and managed to squeeze through a little hole used for letting the steam out. She bit the rope in two, but the chain she could not, so she killed this cub, but got the other two away somehow. Neither she nor the cubs were ever seen in the neighbourhood again.

“I, and I dare say many more people, have wondered of what use a Fox’s brush is. I thought if he had a short tail, or none at all, he could run much better, not being troubled to carry such a weight as his brush when soaked with water, as it is generally when hunted. I talked in this strain to a friend of mine, a keeper, who knew more about birds and other animals than any man I ever met, so he said very quietly, ‘Some day I will show you.’

“I was, however, so keenly interested in this subject that I would not be satisfied until the matter was explained to me. Briefly it may thus be described :

“The Fox uses his brush to help him in obtaining his food. When my keeper friend made this assertion I doubted it in my own mind. However, one evening he said : ‘Now I will show you a Fox get his supper with his brush.’ The Fox was standing watching three Hares playing on the opposite side of the field, and he just lay down on his stomach in a furrow and kept waving his brush about. Presently the Hares stopped playing, and gradually came towards the Fox. Every time they stopped he put his brush down; when they moved he kept waving his brush about. He followed these tactics until

they (the Hares) were within 6 feet of him; then he made a pounce and got one.

"Since then I have seen them catch Rabbits and Partridges in a similar way. I mentioned this to a gentleman who takes a great interest in natural history, and he said he had seen Foxes catch Larks, Partridges, and other birds in this manner. You can soon prove the development of curiosity in animals by just lying flat in a field where horses and cattle are grazing, and keep waving your legs about up and down. You will soon have them all round you, whereas if you just walked across the field they would not take the slightest interest in you; it is the unknown that attracts, and at the same time frightens all animals—human ones included.

"I always think in the Fox's breeding season, January and February, to hear them calling at night is one of the weirdest sounds to be heard in this civilized country. You hear the dog Fox first, as a rule, his short bark being uttered three times in quick succession. Then he runs on a bit and gives three more, the vixen answering with a cry between a cat and a baby. On snowy nights I have got between them, and have seen the dog Fox, but never the vixen. One night the dog Fox came straight to where I was standing. I made some snow-balls, and waited until he got within 10 yards of me and then pelted him. He only gave a snarl, and went some 50 yards lower down the hedge and crossed, going on with his peculiar love-song.

"What is the largest litter of cubs you have ever known? A farmer told me he was riding down a fence-side when a Fox jumped out of an old oak-tree right under his horse's nose. Thinking it peculiar, he got off and examined the hole in the tree, and found eleven cubs, not more than a few days old."

In response to my correspondent's invitation to give my opinion on the last point he raises, I must candidly confess I have never known the Fox to have a larger litter of young than five. The average number is from three to five. I am at a loss, therefore, to account for the extraordinarily large litter that he mentions, unless the explanation be that two vixens had removed their cubs to the seclusion of the old oak-

tree mentioned. It does not seem possible that they were the progeny of one animal. When it is remembered, moreover, that the Fox is a very solitary animal (although on occasion it will share the same "earth" as a Badger), the presence of as many as eleven cubs in one "nest" must remain at present a mystery.

Little can be added to the accounts already given of this sagacious animal's biography, but it should be stated that the food does not exclusively consist of game-birds and the feathered tenants of the farm and poultry yards, for Hedgehogs, Rats, Mice, garbage upon the seashore, Rabbits, Insects, etc., are also largely eaten.

Fox cubs are born towards the end of March. They are blind for the first eight days or so, and are very pretty little creatures. They are dark in colour, fluffy, and have snub noses.

The adult Fox is about 4 feet in length. Our own English Foxes are almost uniform reddish in colour, varied with grey, with white on the under parts and tip of the tail. There is some black on the head and legs. The sleek animal of England, however, is replaced in the Highlands of Scotland by a race of larger animals, grey in colour. These latter do not afford the "sport" of our own red Fox, and they are shot and trapped without hesitation. They are very solitary animals, rarely being seen in open country, and possess a keen preference for the lonely hills.

The Fox of England passes the daytime curled up in its "earth," and the amount of soil that is sometimes thrown out is remarkable. From one "earth" of my acquaintance, situate in a sandy grass-field, there must have been removed two or three cartloads of soil. It is stated by Mr. Aflalo that, "though known to excavate now and again the 'earth' in which, curled up like all Dogs, it passes the day, and in the hills frequenting heaps of fallen rocks, it more often appropriates the burrow of the Badger." It will also rear its young above ground, in the stub of a tree, and, so far as my own experience goes, never excavates an "earth" on its own account.

The well-known scent which this animal gives off, and to which Mr. Slaytor has referred in his notes, is secreted in a gland beneath the tail.

**Pine Marten and Polecat.**—We may bracket these two Mammals together, owing to their comparative rarity in this country. It is unlikely that the young naturalist will be able to observe either, but a few notes may be of interest. Both animals claim relationship with the largest family of Carnivores that we have (the *Mustelidæ*); indeed, after this family we have only the Seals to deal with (Family *Phocidæ*), and these, as a matter of fact, are not typical of the Order Carnivora, being relegated to a sub-ordinal group of the Order—known as Fin-footed Carnivores.

We will, then, take the *Mustelidæ* family first, and, as a result, we shall make acquaintance with several interesting animals, such as the two rare ones here mentioned, and then the Stoat, Weasel, Badger, and Otter.

At one time the Pine Marten was a common British inhabitant, and its fossil remains have been discovered in many places. As a living animal, however, it is to be regarded to-day as of uncommon occurrence. Although found in one or two Southern Counties, its chief stronghold appears to be Cumberland. It is rare in Scotland, but, according to Mr. Barrett-Hamilton, is by no means so in Ireland. It inhabits woods and plantations for the most part, but not exclusively, for it has been recorded from rocky habitats in the open country. This is an expert climber, and, when breeding, resorts to an old Squirrel's "drey" or a Magpie's nest. Sometimes, however, the animal breeds among rocks in the North of England. The litter consists of four or five, but the number varies. When it is remembered that this is a prolific breeder (at least two litters being brought forth yearly), one is enabled to judge how comparatively rare an animal may become as a result of unremitting persecution. The food consists of birds and their eggs, small mammals, and reptiles. The general colour is rich brown; throat and chest yellow.

The distasteful odour of the Polecat is absent in this species, and although its fur is less valuable than other fur-bearing animals, Marten skins still command a good price, and the fur is of considerable importance commercially.

The Polecat has long dark brown fur, yellowish underneath. The blackish head bears white markings near the ears and mouth. It measures about 17 inches, the tail about  $7\frac{1}{2}$  inches; maximum weight about 6 pounds. This is a rarer animal than the Pine Marten, and except in a few favoured districts is undoubtedly upon the verge of extinction. The rapid increase in game preservation has resulted in the annihilation of the Polecat, yet I remember as a boy seeing at least one of these animals trapped in Hertfordshire, but never one since. Gamekeepers of my acquaintance who can go back thirty or forty years and more, have never met with the animal, and its extinction is directly due to those responsible for the rearing and preservation of Game and Rabbit-trapping. This latter has resulted in the depopulation of the Polecat by reason of the fact that the Rabbits attracted the former, and the animal suffered for its unwariness by being caught in the steel traps set to catch the rodent.

The habitat is somewhat similar to that of the Pine Marten, and the species is mostly nocturnal in its wanderings. In early summer the female gives birth to from four to six young ones, a deserted Rabbit burrow being a favourite breeding-place. In colour, the Polecat is uniform dark brown and blackish. There are some white markings on the sides of the head and in the vicinity of the mouth. The tail is bushy, but it is not so long as that of the Marten. This animal is a fine swimmer, and hence we find Eels included in its dietary. It much prefers, however, Poultry, Ducks, Rabbits, and young Game-birds, whilst Frogs and Toads are also eaten. It has a voracious appetite. The disgusting smell which the Polecat emits proceeds from what is known as the anal pouch, and whatever the animal comes into contact with is impregnated with it.

In view of the number of escaped Ferrets that are incorrectly recorded from time to time as Polecats, it is important to state that the first-named is a domesticated variety of the latter. It is a smaller animal and lighter in colour.

**Stoat.**—This is a much smaller species than the last, being about  $10\frac{1}{2}$  inches in length, and the tail  $6\frac{1}{2}$  inches. These

are the lengths of the male, the female being the smaller of the two. The colour is reddish-brown above, with yellowish-white on the chin and under parts; the tail is tipped with black. In Winter—when the animal is known as the Ermine—the colour changes to yellowish-white in colder regions. This change of dress during the Winter season holds good throughout Scotland, and frequently in the North of England. In the South and Midland Counties it is, however, of uncommon occurrence, for although I see a large number of Stoats all through the year, I have never noted the curious phenomenon. It should be stated, however, that this colour change (obviously for reasons of protective coloration) does not invariably take place during Winter, which seems to be a direct contradiction to one of Dame Nature's devices for the protection of one of her Mammal children.

This is a very much commoner animal than its two larger relatives already described. Indeed, my own observation leads me to conclude that it is as common to-day as in years gone by, and especially in the neighbourhood of Game preserves. That it possesses a distinct partiality for the eggs of Partridges and Pheasants I have myself witnessed on several occasions, and I knew of one instance where over seventy eggs were ingeniously packed together without one being cracked or injured in any way. And how do you imagine the crafty Stoat contrives to take eggs from a nest and despatch them to its hiding-place? Fortunately, I can answer the question as an eyewitness, for I once observed a Stoat engaged at a Partridge's nest. By keeping quite quiet I noticed the animal stealthily purloin an egg from the nest, roll it down a bank on to a field, and then push it along the ground with its snout! Here was the whole secret of how the eggs above mentioned were safely located in the hiding-place of this ingenious little creature.

I find that I am not alone in regard to the finding of eggs secreted by the Stoat, although previously unaware of the record. Mr. W. E. de Winton states, for instance, that in 1894 he took forty-two Pheasants' eggs from one hole in the month of May. Besides eggs, the Stoat feeds upon Birds,



Rats, Voles, young Rabbits, and Hares. It is swift of foot, an animate and an elegant being, and can swim with ease and facility. •

From five to eight young ones are produced in early Summer, and these are blind for the first few days. Their mother takes charge of them all through the Summer, and does not leave them until Autumn. It takes about twelve months for the young Stoats to become full grown. Stoat "packs" have on occasions been encountered—more especially in the Autumn—as if undertaking some kind of migratory movement. When thus lighted upon it is said that the animals are dangerous to meet, and will attack man in a body. Individually, the Stoat possesses a remarkable influence when chasing a Rabbit or Hare, for the rodent will be seen to stop and appear so absolutely paralysed with fear as to be unable to continue its movements! Thereupon the Stoat quickly comes up to its prey, and at once despatches same in less time than it takes to tell the story. Mr. Richard Lydekker (to whose studies of the British Mammalia we owe so much) states that "if taken in such a paralysed condition, a Rabbit will be found to have its eyes closed, its heart palpitating violently, and its limbs almost useless; and it is not till left alone for several minutes that it will revive." This seems to be a merciful provision of Nature indeed.

**Weasel.**—Several of my gamekeeper friends will persist in stating that there are two distinct kinds of British Weasels, and I remember not long since a couple of these animals being shown to me that exhibited a vast difference in regard to their relative sizes. One was a very small animal, the other abnormally large. The smaller specimen was a pregnant female, so that she was quite adult, and not a young Weasel. It seems that some of the earlier Natural History writers alluded to a smaller species of Weasel, but it is generally agreed to-day that, owing to the great variation in size (especially in the case of the female) to which this animal is subject, both the smaller and larger Weasels belong to one and the same species. Gamekeepers call the larger variety the Weasel, and the smaller one the Cane Weasel, but I am unaware of how the

word "Cane" originated. Gilbert White refers to this matter in his well-known classic. I give gamekeepers much credit for their intimate knowledge of the life and habits of a number of animals, and it seems to me that there may perhaps be, after all, something in their assertion upon this interesting point, although I am aware of the definite statement to the contrary made by competent authorities. Pending more detailed information, however, the matter, like that of the Adder swallowing her young in the time of danger, must remain in abeyance. The Weasel is much smaller than the Stoat, measuring about  $8\frac{1}{4}$  inches over head and body. The female is about  $1\frac{1}{4}$  inches smaller. The coloration of this Mammal is somewhat similar to that of the Stoat, but the former is redder, and the yellowish colour below is not so marked.

This is a common inhabitant of our country, and a most engaging, active creature—so much so, indeed, that one needs to have a very quick eye to follow the little animal as it craftily contrives to noiselessly glide through a hedge-bottom in quest of food.

I find that the Weasel hunts a good deal during the daytime, especially so in hard weather. When observed in an open field it is possible to run it down, as I have often witnessed when I have been making my pilgrimages along the countryside in company with a gamekeeper; but when there is any cover near it is a far more difficult matter to capture the wary little rascal. When running, it darts and springs with alarming rapidity, as also when deftly threading its way through a hedgerow or thicket. It is a savage beast, too, like its near relative the Stoat. I have seen both animals caught in traps a number of times, and before the death blow has been dealt I have observed them show keen fight in a truly heroic manner, the Stoat in particular. The Snake-like body twists and turns in a remarkable way; the animal shows its teeth and snarls much after the manner of a Cat when teased.

A remorseless enemy of the gamekeeper (at least, so 'tis said, and I candidly confess not without adequate reason), it is interesting, and indeed important, to note that to the farmer the Weasel is an unspeakable blessing, and I have no hesitation

in stating does far more good than harm. It preys largely upon the Field Vole and the Common Rat, and in reducing the number of these two rodents performs a good and useful work, the value of which cannot be overestimated. It will also pursue the Mole in its underground runs. Beyond this it is a first-rate climber of trees, and will pursue its prey when it resorts to this mode of escape. It feeds also upon small birds, and will attack the inhabitants of the poultry-house. \*

The Weasel produces a litter of five or six young two or three times during the year, and it is an interesting sight to watch a young family being towed along the countryside by their solicitous mother. Not long since I knew of an instance where a keeper saw a female rear her head in a grass-field, for this animal possesses this habit for the purpose of looking around to see who is about. My keeper friend at once fired, and not only did his one shot kill the mother Weasel, but also four young ones who were following close behind her !

This is a pugnacious little Mammal, and very bold. It can swim well when circumstances demand it, but does not appear to take to the water willingly. As showing its pugnacity, it may be mentioned that in the Banff Museum a wonderful mummified group of these animals is located. These were found in the hole of an old tree-stump, and Mr. Lydeker states that all the members of the group evidently perished while fighting together !

**Badger.**—This very interesting animal belongs to the Genus *Meles*, and is a much commoner species than is generally supposed. First let me record some delightfully original observations that have been sent me by Mr. Slaytor, of Doncaster, as his notes cover a good deal of ground, and further repetition from my pen will not be necessary. Mr. Slaytor writes :

“I have sat up many a moonlight night watching for these most interesting animals, and have been rewarded by seeing them when they had no suspicion of an enemy being near. I used to get up a tree as near as possible to the ‘earth,’ taking care the wind was blowing FROM the ‘earth’ to me, as, if the old Badger had caught the slightest taint in the air, I should





have stayed out of bed for nothing. One of my greatest ambitions was to watch the old one out on a hunting expedition, and then hoped the young ones would play outside, and gradually wander away, and give me the chance to slip out of my tree and get between them and the 'earth,' and so catch one. I never succeeded, however, in getting one by this means, although I did get one by chance. I was coming home across a field one night, accompanied by a six-months-old terrier, when I noticed him chasing something, and then I saw the performance reversed, and the terrier being chased. On going to see what was happening, I found it was a very fine young Badger, which I managed to catch with the terrier's help, and carried him home in triumph by the tail. A Badger cannot turn up to bite when carried in this fashion, although you would have to be very careful in carrying an old one, or he would get hold of your legs. I kept this young one until he got full grown. It was astonishing how quickly he became tame, for within a fortnight he would eat out of my hand, his favourite food being Indian corn, his next favourite being a nice fat Blackbird!

"I have caught old Badgers about midnight by having a couple of friends with me with terriers that were used to the game, and leaving my friends posted in a wood half a mile or so from the 'earth,' whilst I would get hidden near the 'earth.' After watching for some little time, the Badger would come out of his house and stand on the doorstep, with his nose turned upwards, trying to catch the slightest taint in the air. If he was at all suspicious, he would remain absolutely motionless for half an hour, and then, if he was satisfied the coast was clear, he would shuffle off with his peculiar sidelong action. If he was not satisfied, he would quietly turn round and retire into his 'earth,' leaving us to do the same, as if a Badger thinks he is being watched he will not put in an appearance again that night. When I have seen him well away, I have slipped out of my tree and pushed an ordinary corn-sack down the 'earth' bottom first, and then fastened the mouth of the sack to the floor and roof of his 'earth,' so as to make it appear as much like the real entrance as possible. When all

is ready, I retire to my tree again, and give a whistle. My friends let the dogs go, and they hunt about until they get the fresh scent. The Badger soon finds out he is hunted, and he scrambles along at best pace for his 'earth.' If the dogs are fairly close to him, he blunders into the bag, when I would get to it as quickly as possible and tie the mouth of the bag up, and await my friends' arrival. If the dogs are not close to him, he will go home by some other door you have missed, and leave you to go away, wondering whether animals are endowed with instinct or reason.

"I have been told by people many times that they have a terrier that can 'draw' a Badger, but I am very hard of belief, as the Badger has a very nasty habit, on being alarmed, of retiring to the very end of his 'earth,' and banking himself up with sand, only just leaving his head get-at-able; so that when a dog attacks him he has to face his teeth and his formidable claws, whereas the Badger has no vulnerable spot exposed. I have had as good dogs as anybody, and have never seen one of mine move a Badger. I have had dogs stay to ground seven and eight hours whilst we were digging, and when we have got to them have found them fast hold of one another, and have taken hold of the dog and have pulled out the Badger with him, neither even relaxing their hold. A dog can soon worry one in the open, but in the 'earth' I think it next to impossible. Of course, there may be 'earths' that favour the dog, such as hard rock. I always consider the Badger to have the best nose and ears for detecting danger of any animal I know. I remember once seeing a thing I never have understood. I was walking through a wood at midnight one beautiful July night, and on passing down a ride with Pheasant coops on each side, I was tempted to sit down on one of them and have a pipe. Whilst sitting perfectly still smoking I heard a peculiar grunting noise coming towards me. Not knowing what it could be, I remained still until I saw a very fine Badger coming along, trying every Pheasant coop to see if the tenants were obtainable; but being all securely fastened, he kept coming along until he passed me within 2 yards. Now, how was it he did not smell me? The only solution I can

think of was that, being smoking, he could not smell my breath, as I think that is what a wild animal smells when the scent-gi~~er~~er is at rest ; but whether that is so I do not know.

"I remember a poacher who was a very good hand at picking a Rabbit or Hare off the seat telling me he saw what he thought was a Hare sitting on a bank-side. He jumped through the bushes and picked her up ; but, to his surprise, it was a fine Badger, which he dropped very quickly, and started hitting it with his stick. The Badger turned on him at once, and thus frightened him so much that he was glad to let his victim alone.

"There is one matter I should like to convince Masters of Hounds of—viz., it is to their interests to preserve Badgers, as, instead of being an enemy to the Fox, he is a most valued servant. Everybody knows that a Fox is a most untidy and dirty housekeeper, and the Badger the most cleanly. Now, the Badger acts as housemaid to the Fox, eating and cleaning away all offal, and so keeping the 'earth' clean. If there were more Badgers in Fox-hunting countries, there would be less mangy Foxes. I have known a vixen and Badger to have young ones in the same 'earth,' and be a most happy party."

In general colour the Badger is yellowish-grey, washed with black ; black on limbs and underneath ; white face, with a prominent black longitudinal streak on each side, passing through the eye and ear. Length of head and body about  $2\frac{1}{4}$  feet. The tail is short (about  $7\frac{1}{2}$  inches), but well covered with hairs, as also the soles of the feet. Owing to its shy and nocturnal habits, it is a difficult matter to observe this most interesting animal at all closely, although Mr. Slaytor has clearly shown that, if one is willing to naturalise when most other people are in bed, then, by careful and painstaking work, many delightful experiences may be obtained. Formerly this was a much commoner species than it is to-day, but there are many districts where it is still possible to locate a Badger at any time. I have myself come across the animal within a few miles of London, and not long since a Badger was seen in broad daylight within a hundred yards or so of my Hertfordshire home. An ancient name for the Badger—namely,



"Brock"—may be traced to-day in many names of places, which need not be detailed, and it is interesting to notice that this name (at least, so says Mr. Lydekker) apparently refers to the striped face which forms such a characteristic feature in the animal under consideration.

During the day the Badger remains concealed in its burrow. This latter is hewn out in various places, such as a wood or thicket, the side of a hill where bushes abound, a disused quarry, etc. When the "earth" is opened it is found to contain various chambers and passages, and an excellent illustration of an exposed interior appears in my book, "A Year with Nature."

When night steals on apace "Brock" comes forth from his retreat and commences his feeding operations. The dietary is made up of Roots, various Fruits, Birds' eggs, small Mammals, Reptiles, Frogs, and Insects. It also exhibits a strong partiality for Wasp grubs, and is apparently immune from the attacks of the distracted tenants of the Wasp citadel owing to its thick fur.

The nest is situate in the burrow, and is composed of grass. The young number three or four, and are born in early Spring. They are blind at birth, and do not attain their sight for several days. Some time is passed by the young Badgers in their secure retreat, and they do not essay forth from their hiding-place until well able to look after themselves and procure food on their own account. The powers of hearing and scent in this animal are very remarkable, and the slightest suspicion of the presence of a human being is sufficient to send him running towards his "earth" with lightning rapidity. Mr. Trevor Battye mentions the interesting fact that the Badger can walk and trot *backwards* with the greatest ease.

**Otter.**—This really beautiful little animal is a most engaging and active creature, and those who have visited the Zoological Gardens will probably remember the vastly entertaining occupants of the Otters' "cage." Their powers of movement in the water are very wonderful to behold, and those of my readers who cannot manage to observe this animal in its wild state would do well to visit the famous collection in Regent's Park, and intelligently study the animals



YOUNG BAD



there located. Deep brown is the general colour of the Otter, tinged with rufous. Underneath, the woolly fur is white at the base, then brown and paler at the tips; whitish under parts; chin and throat white. The tail is more than half the length of the body, measuring from 15 to 16 inches. The head and body are from 25 to 29 inches in length.

Whilst still a common inhabitant of many of our rivers, the Otter has disappeared from several of its former haunts, partly owing to incessant persecution. As an example of its former abundance, it may be mentioned that on one estate in the North over 260 Otters were killed in four years! It not only resorts to fresh water, for it pursues fish in the sea, and on various parts of our coast resorts to caves, caverns, and rocks. It can run swiftly, but its more graceful and captivating motions are to be observed when the animal is in the water. It lives almost entirely on fish, and anglers complain bitterly of its ravages, and not altogether without reason, for it kills apparently more fish than it requires. Whilst admitting this much, it seems a thousand pities, however, that such an interesting inhabitant of our rivers should be hounded to death in the manner it is; and, angler as I have been, I have always valued the animals surrounding the water as much as (if not more than) those within it.

The lair of the Otter is known as its "holt." It will resort to a burrow in a bank-side, or among the roots of trees, or other similar habitats.

In the early Spring the female gives birth to from three to five young ones, and it is an engaging sight to light upon the dog and bitch Otters accompanied by their progeny. The young ones keep company with the parents for some time. It is mainly nocturnal in its habits, but on some unfrequented rivers may be noticed during the day. In foreign lands these animals are much sought after for the sake of the beautiful pelage, and many thousands are slain annually—so much so, indeed, that upwards of 10,000 skins make their appearance at the Easter fair at Leipzig every year. These fetch various prices, according to size, condition, colour, and quality. Anything from five to thirty shillings may be mentioned.

Mr. Slaytor—to whom I am already so much indebted—sends me the following observations with regard to this animal:

“I wish you would write something on the cruelty of Otter-hunting. At the time of the year it is usually carried out—viz., the Summer-time—I have been with Otter-hunters many times, but it has always struck me that it is a very cruel sport. They hunt them just when they are breeding, and I have seen old Otters heavy in young, quite incapable of either escaping the hounds by swimming or fighting. Then you see an old Otter with very small kittens, which she will not leave and so get a chance of escaping; and after a desperate fight, in which she has a hundred-to-one chance, she gets killed, and the kittens are either left to die of starvation or they are killed as well. The Otter is a wonderfully sporting animal to hunt if he has no family to protect, as I consider he should be classed in the same category on account of gameness as the Badger. Like the latter, the Otter is one of the most innocent of our animals if left alone.

“When I was a boy it was the height of my ambition to have an Otter for a pet. After spending most of my spare time on the river-bank trying to catch one, I managed to do so by absolute chance. I was fishing about nine o'clock one June evening when, on drawing my line in, I found it fast to something. On pulling there was a most peculiar noise, something like a baby crying, and I found a little Otter caught just behind its foreleg. I got him landed, and whilst I was getting the hook out, the old Otter swam up close to me, showing herself in such a manner that if I had been so disposed I could have easily killed her with a stick. I thought far too much of my prize to think of her at all, and I took the baby home and fed it on new milk, and then on bread and milk. It very soon was as tame as a cat, and would follow me about. I kept it until school-time, and then had to give it away to a gentleman who was a collector of rare birds and other animals. I believe he had it with several others for years. They were all perfectly tame, and ran about on his lawn playing just like kittens. They are very interesting pets, and become so tame and safe to handle. This is very remarkable considering they

are so very shy and difficult to see when they are wild. There are really a great many Otters in our rivers ; but if you talk to men that<sup>o</sup> have fished for years, you do not find many who have seen them. I was fishing one evening when a very fine Otter came out of the water on the opposite bank, running along for some way until it caught sight of me, when it dived into the water as only an Otter can dive, without the slightest noise or splash, just as if the river was made of oil. There has been a brood of Otters within a mile of Doncaster this year (1907), and the gentleman owning the fishing gave strict orders they were not to be disturbed, which they (the Otters) were not slow to find out. You could see both the old ones and their family any evening playing and swimming about within a few yards of you. The young ones looked more like Polecat-Ferrets than anything else. Now they have disappeared ; but I do not think they have been killed, but just gone away, perhaps on account of wanting a change of diet.

“A few years ago I had a wonderful rough mongrel terrier, who was a very great help to me in natural history pursuits. He was absolutely obedient, and if told to come behind, he would creep behind me, and when I stopped he stopped, never wanting a word to keep absolute silence. All the Rabbits and Rats could pass under his nose without a movement on his part. I am fortunate to still have the breed, and nobody will ever steal one! I used to go down the river-bank with him, and examine every dike at its entrance to the river. If there were any Otters about, you would be sure to find their footprints in the soft mud ; then I used to track them inland. When I was beaten, I put the dog on, he being possessed with a capital nose, and between us, after expending a good deal of time and patience, we were rewarded by a find, perhaps a mile from the river. The Otter, being disturbed, would take to the cover of the nearest ditch, and so work his way back to the river, giving a lot of very pretty work for the dog. I often found one in this way, *but never killed one*, though if the terrier could have got up to one he would have done so.

“I remember once in the Winter-time walking down the river-side when it was in flood. The dog stopped at a pollard

willow-tree overhanging the water, and after a few preliminaries a very fine Otter jumped into the water, and, curiously enough, did not dive, but swam straight across the flooded land. The dog followed, the Otter getting about a yard start. It was the most exciting race I ever saw, though I fancy the Otter knew he was in no great danger. To use a racing phrase, he went well within himself and won easily, and disappeared.

"Once in the Summer-time I was walking down the same river with my four-footed companion when he winded something up a pollard tree hanging over the stream. I climbed up it, and found a nest of grass on the top, with four fair-sized baby Otters. On seeing me, they promptly dropped into the water, and were out of sight in a second. If I had known, I could have netted the lot. It would have been a grand haul.

"Last Spring I saw several times a very fine Otter running about in some barley, and one morning I fetched the terriers and hunted him. He followed Otter tradition, and took every advantage of the cover in the hedge-bottoms, and so worked his way back to the river. I never saw him again. I believe if an Otter gets hunted once and frightened, he goes away the next night. I knew a man whose house was close to the river-bank, and he often told me an Otter had passed up the night before, so I asked him how he knew. He said by his ducks being uneasy and quacking."

**Common, Harp, and Grey Seals.**—Whilst inhabitants of the sea cannot be accorded a prominent place in our volume (and for this reason Sea Fishes are entirely eliminated), it is necessary that a few notes should be given of such animals as Seals, Whales, Porpoises, and Dolphins. Our chief object in this book, however, is to devote attention to our commoner forms of British animal life, and those most easily observed. The Seals conclude our list of the Carnivora, but before passing on to our next important Order—the Rodentia—we may briefly enumerate the salient features of three British species. As has been already mentioned, the Seals are, strictly speaking, not true carnivorous animals; but they are very closely related, and in any case follow immediately after them in scientific sequence.

These are fur-bearing, paddle-footed animals, and, whilst not hunted in our own country for commercial purposes, in other lands and seas an enormous traffic is carried out among them. As a matter of fact, our few British representatives of this most important and interesting family do not possess any under fur, and consequently have no commercial value. By no means common, as its name implies, the Common Seal is an inhabitant of estuaries situate in the North, although occasionally it is recorded from elsewhere along our coastline. It breeds during the Summer, producing one or two young ones. Brownish-grey, spotted with dark brown, is the colour above; underneath, the colour is lighter and unspotted. Length, about 4 feet.

On the back of the Harp Seal there is present a curious black mark, and it is owing to this that this species has been accorded its English name; otherwise, it is grey in colour. It measures about 4 feet, perhaps a few inches more, and is a rare visitor to the British Isles. Like the last-named, it is gregarious in its habits.

The Grey Seal is restricted to the northern parts of our island and to the South of Ireland, but is fairly common in these localities. It may be identified by the flat skull. As its name correctly implies, this Seal is grey in colour, profusely marked with black. It is stated on good authority that this species does not possess the intelligence exhibited by its relatives, and this is a very interesting observation when one considers the flat skull already mentioned, and also the fact that the face of the Grey Seal lacks expression.

I feel it a duty to protest "right here," as they say in America, against the shooting of these interesting animals. When one of these animals does put in an appearance it is often promptly shot, or otherwise done to death by some ungainly loafer, and is afterwards, perchance, put into a glass case as a wretched caricature of the animate being whose life was so wantonly destroyed.

#### Order IV.—RODENTIA

Amongst the members of this Order we shall make acquaintance with quite a number of well-known Mammals; indeed,



the Order Rodentia contains more species than any other on the British list. These Rodents, or Gnawing Mammals, are characterised by a pair of chisel-like incisor teeth situated in the lower jaw, and other distinguishing features which need not be detailed.

**Squirrel.**—This interesting little tenant of our woodlands seems to be a general favourite, excepting among gamekeepers. Not all the latter fraternity, however, persecute the sagacious rodent, for it certainly does not perpetrate a deal of harm among Game-birds, being chiefly arboreal in its habits. When a Squirrel is observed upon the ground it is an interesting sight, and will be seen to carry its fine brushy tail well in the air rather than permit it to drag along the ground, for it is very proud of this characteristic appendage.

Most country people appear to be under the mistaken impression that the food of this engaging little animal consists solely of nuts, but my friend Mr. H. E. Forrest, of Shrewsbury, has paid considerable attention to this, and the result of his inquiries and observations enables him to put on record that, although nuts are without doubt the staple article of food, they are by no means the only one, as the following list will show. Mr. Forrest's "bill of fare" includes: nuts, beech-mast, haws, leaf-buds, bark, mushrooms, certain fungi (reputed poisonous), cherries, birds, and eggs.

Has the reader ever had the good fortune to catch a Squirrel enjoying a meal? It is one of those delightful little sights in the woodland which one would not have missed for anything. I was watching one recently in a favourite copse. There he was, perched on the pliant branch of a Scotch fir-tree, his back against the bole of the tree, and his fine brushy tail brought right over his back. Ears raised in an expectant manner, eyes glistening, the animal looked a veritable picture. In his fore-paws he held a fir-cone, and it was an interesting sight to watch the pretty creature gnawing away at the cone, extracting the seeds therefrom. Of course, I had to hide myself. Had I not done so these lines would never have been written. My patience exhausted, I came out into the open. Down came the fir-cone pelting to the ground, and away



SQUIRREL  
(*Sciurus hudsonicus*)



scampered Master Squirrel. He went round and round the tree a good deal faster than I can write, and now and then I caught sight of his pretty little head as he played hide-and-seek with me. Then he reached the topmost branches of the tree, springing and darting with amazing dexterity and cunning. Presently he came right over my head, and I had a fine view of his outstretched body. Then he hesitated, for he had reached the outermost branches, and it was a matter of several feet to the next tree. The Squirrel does not stop at trifles, however, and before I had time to realise it the wary creature had summoned courage to his aid, and sprang a distance of at least 25 feet to the next tree, and was then lost to view.

On another occasion a pair of Squirrels entertained me by their quaint and winning ways; their cleverness in deftly moving like a lightning flash along the thinnest branches of the Oak, threading their way, as it were, like a flame of fire, and springing with agility and exactness from tree to tree to the thick cover of the Spruce Firs. The female was in sore distress at the incursion of mankind into her sacred fastness; she mewed loudly and continuously, sat on her haunches, brought her fine bushy tail over her head, and bravely stared me in the face. A moment's deliberation, and the winsome little Mammal darted off in less time than it takes to tell this woodland story, passed high overhead, following exactly the same route as her jealous little companion. Spring was in the air; even the Squirrels proclaimed it by carrying out their perambulations away from their hiding-places in the sombre Firs.

The general colour of this favourite little animal is brownish-red above, and white below; the bushy tail is the same colour as the body; ears tufted during some part of the year. The length over all is about 16 inches.

The "drey" of this Mammal is a common object in the districts it frequents. The nest is composed of moss, roots, grass, leaves, and other materials, and is often placed in a Fir-tree. The young number three or four, and are born about Midsummer.

In spite of statements to the contrary as to the torpid state

of the Squirrel during the Winter, I have observed it out and about every month in the year. Whilst certainly not so active during the colder months, it is a mistaken idea that this animal hibernates, as many natural-history books are too fond of stating. That a good deal of harm is perpetrated in plantations seems indisputable, and I have myself seen numbers of promising trees denuded of their bark by these rodents. As a consequence, the flow of sap is stopped during the Spring-time, and young trees especially cannot withstand this malicious wounding, and eventually die. After all, however, it is a very small percentage of harm that is done, and certainly insufficient to justify any thinning out of the Squirrel's ranks (I knew of five which were shot in one morning recently close to my house) and the loafers who worry and tease these interesting woodland sprites by means of that most detestable of weapons, the catapult.

**Common Dormouse.**—This animal reminds one of a small Squirrel-like little creature, with a long tail, short fore-limbs, and large eyes and ears. The colour above is light tawny, paler and yellowish below; on the throat and front of chest there is an elongated patch of white. Length over all, about  $5\frac{1}{2}$  inches.

Like the last-named, this is an arboreal Mammal, and is usually found inhabiting woods, plantations, hedgerows, and similar places. It has a special liking for Oak-woods, where Nut-Hazel trees form the undergrowth. It dearly loves Hazel-nuts, but also feeds upon acorns, various large seeds, grain, fruit, and insects.

When it does not build a nest of its own, this delightful little animal will take possession of the deserted nest of a bird, and in Winter-time I have found a nest of the Dormouse fitted up inside a Blackbird's homestead, and the inhabitant soundly asleep. Its hibernating habits are among the most interesting in connection with it. Although it stores up provisions for the Winter, sometimes the little creature slumbers, more or less, throughout half the year. When the weather becomes mild, the animal will bestir, and partake of food from its store perhaps, but soon relapses into slumber again. When found



*PLATE XIX*



curled up in its nest and disturbed from its sleep, the Dormouse does not exhibit the slightest fear; indeed, it makes an amusing and docile pet.

The four young ones are born in the Spring. They are born blind, but soon open their eyes, and are able to look after themselves very quickly. At first they are mouse-grey in colour, with the exception of the head and flanks, and the adult dress is only assumed by degrees.

**Black Rat.**—Among the various Genera with which we are now concerned, the Genus *Mus* (namely, Rats and Mice) contains a larger number of species than any other among the British Mammalia. Our own representatives are divided into two sections, the one containing the Mice and Rats, the other the Voles. Whilst generally regarded with much distaste by many people, several of these animals are really clean, trim, and elegant creatures. Some of them are herbivorous, as we shall show hereafter, and must not be confused in their habits with the Common Rat and Mouse.

First, then, as to the Black Rat. To-day this is a comparatively rare species when compared with its relative *Mus decumanus* (the Brown Rat). The young naturalist may consider himself fortunate to come across it. Variable in size and colour, the fur generally may be described as greyish-black above, and ash colour below. The slender head bears upon it large ears, and the tail is long and thin; indeed, the latter measures about  $7\frac{1}{2}$  inches, and the head and body combined only about 7 inches. The habitats chosen by this Rat when it was a common species among us were similar to those of its Brown relative, and at the time it was abundant much harm was perpetrated in granaries and elsewhere. Most solicitous for its offspring in a wild condition, voracious in disposition, exceedingly clean, and, for the most part, a social animal, it seems a pity that such an interesting member of our Mammal Fauna should now be on the verge of extinction; but the ravages of the Brown Rat alone are now causing much attention, and it is perhaps as well that we are almost rid of the species under review.

When in the North of England one Autumn I was much



interested in a pair of these animals kept by a friend of mine in a room next to his bedroom that contained living Rats, Mice, Frogs, Lizards, and Snakes, and among the latter the largest Boa Constrictor in Europe. Soon after I left for my Southern home I heard from my friend that the female Black Rat had given birth to three young ones, and had *not* eaten them! This is the third litter of young ones she has had, but in each of the other cases she ate the young ones the same day as they were born. There were three in each litter, and my friend suggests that *perhaps* this small number, compared with the ten or a dozen of the Brown Rat, accounts for the rapid increase of the latter as compared with the former. Born blind, at sixteen days old the young had opened their eyes, and the mother took great care of them, and did not object to her youngsters being handled. Eventually these young Black Rats became fully grown. They became wilder than their parents, but did not bite, and my North Country friend is justly proud of his success in rearing the species *in captivity*.

**Brown Rat.**—A crusade against the Rat plague has been declared by scientific men, who are aware that the most objectionable of all vermin are, because of their habits and their parasites, a grave danger to the national health. Sir Lauder Brunton, who is one of the leaders of the movement for the formation of a National Association for the Destruction of Vermin, has expressed his hope that some venom will be discovered which will eventually destroy all these plagues. The Rat has been attacked in the past by many agencies, but only with slight success, and the scientific research of recent years has shown that it carries the germs of the most virulent disease. London is said to be the chief Rat-centre of the world, and it is contended that the plague should be wiped out by organized methods. The old-fashioned remedies are not efficacious, and the resolve of scientific men to destroy these pests by the direct application of recent discoveries will be approved by many who suffer from the ravages of vermin whose destructive capacity is estimated to cost us hundreds of thousands of pounds every year.

• An exterminating war is being waged against this rodent

not only in our own land, but in all countries it frequents, and when one considers that it is one of the most fecund pests with which mankind is afflicted, there is small wonder at this. A writer in *Chambers's Journal* gives some striking figures concerning these detested pests, from which the following information is taken :

"They breed from three to six times a year, the females having their first litter when about three months old. The average litter numbers ten, but often it will aggregate fourteen or more. If three litters of ten each are produced every year, a single pair, if permitted to breed unchecked, and no losses from death were experienced, would in three years have a progeny of ten generations, numbering twenty million, one hundred and fifty-five thousand, three hundred and ninety-two ! The eleventh generation, due at the beginning of the fourth year, would number over one hundred millions ! The United States, like India and other Oriental countries, is now confronted with a Rat plague, which has grown to such proportions that the Department of Agriculture has found it incumbent to prepare a bulletin setting forth extermination remedies for the benefit of the assailed farmers. This rodent is more destructive than any known Mammalian pest. In France, Rats and Mice are responsible for damage to the tune of over £8,000,000 per year ! A single Rat will eat two ounces of corn a day, but destroys and spoils more than it eats. The greatest indictment against the animal, however, is that it is one of the most dangerous mediums for the dissemination of disease, due to the parasite with which its fur is thickly infested."

The Brown Rat is somewhat larger than its Black relative, being about  $16\frac{1}{2}$  inches over all. It has, however, a shorter head and tail, and smaller ears. It is greyish-brown above and whitish below. Varieties appear from time to time showing both albinism and melanism. It is interesting, in view of the wide distribution of this rodent, to know from where it first originated and thence spread with such amazing results as we see to-day. At one time India was thought to be its home, but it is now stated that Chinese Mongolia is the more likely country from which this animal first migrated. It appears that, carried

by vessels, this species first made its appearance in our own country *about* 1700. It was a later arrival than *Mus rattus*.

Of the various places of abode which the Brown Rat adopts it is unnecessary to write. Slaughter-houses, warehouses, ships, dwelling-houses, stables, drains, sewers, canal and river banks, islands, etc., are among its chief strongholds. Even in spite of its oftentimes filthy surroundings this is a clean animal, but its destructive habits result in few people regarding it other than as a pest. Its dietary is a large and varied one. Offal, meat, household food and articles, young chickens, eggs, grain, vegetables of various kinds, Frogs, Snails, and the dead bodies of its own kith and kin, are some of the dishes included in its bill of fare. In moving eggs along the ground it resorts to the same clever device as the Stoat already referred to. It has been known to enter the water and seize a young Eel, but on occasion the tables are turned, as the following incident will show. A correspondent writes :

"I lately witnessed an extraordinary struggle between a Rat and an Eel.\* I was fishing up the River Walkham, in Devonshire, and had just reached Hackworthy Bridge, and was looking from the road into the pool beneath in search of a 2-pound Trout which had taken up its abode there, when I saw a considerable commotion at the bottom of the pool. Close examination showed me a large Eel, some 30 inches in length, struggling for mastery over a full-grown Rat. Fur and fin rolled over and over at the bottom of the river, but eventually, at the end of three or four minutes, the Rat was overpowered, and the victor towed its lifeless body into a hole in the bank, and I saw no more."

This Rat appears to possess a keen enjoyment in purloining silver and silver-plated spoons and other articles, and taking the same to its haunts. I have heard of several well-authenticated instances of valuable articles being missed and found eventually in Rats' holes. What reason can be ascribed for this curious habit?

**Common Mouse.**—That Rats and Mice are not altogether unintelligent creatures and of no service may be gathered

\* The probability is that the animal observed was a Water Vole and not a Rat.

from the fact that the unfortunate disaster to the British submarine off Plymouth a year or two ago elicited the interesting information that submarines each carry three White Mice, for the reason that the rodents are so extremely sensitive to the escape of gasoline (to which the sad disaster above referred to was said to be due) that they immediately become very restless, and signal to those on board by a series of squeaks that something is wrong. So valuable have these White Mice become—part and parcel of the submarine's crew, in fact—that the Admiralty allows a shilling per week for each Mouse for "rations."

This is a most interesting instance of how an animal, usually looked upon as positively useless and distasteful by many people, has been proved to be of immense service to man. It would be further interesting to hear from any of the four survivors of the ill-fated submarine A8 whether the White Mice on board gave any warning that something was amiss.

It has been remarked on more than one occasion that White Mice kept as pets are particularly quiet little animals, and hardly ever give vent to squeaks, so that being such a silent species, the Mice could hardly fail to attract attention when heard giving voice. It seems strange to reflect upon the fact that such an essential factor in modern warfare as the submarine is not counted properly manned and equipped unless amongst the crew are numbered three White Mice, and it illustrates very clearly an interesting instance of the development of animal intelligence.

The Common Mouse known to everyone is about  $6\frac{3}{4}$  inches in length (including the tail). The general colour above is greyish-brown, and lighter below. There is, however, much variation in the colour and size of this little rodent, and true albinos—the so-called White Mice mentioned above—are not uncommon, and will breed true for a very long time, if not for ever.

Like the House Sparrow, this animal is cosmopolitan in its distribution, and there are few parts of the world where it has not penetrated. Its haunts are somewhat similar in some respects to the species last under review, but it is more partial

to our dwellings. It will also resort to gardens, warehouses, and fields. Some of these rodents of my acquaintance infest a clothing manufactory, and possess the expensive habit of gnawing a hole in the backs of overcoats and other articles. It is interesting to relate that the hole is almost always located in a part of the garment where it is most difficult and costly to repair! I have also known Rats to move an overcoat to their holes and to devour almost the whole of it. Traps have been set at the said factory, and an enormous number of Mice sent to their doom, and I have been interested to observe the distance it is possible for one of these creatures to drag the trap towards its hole when imprisoned in the same. On one occasion I remember setting a trap overnight several yards from the hole in the floor, but next morning I found the trap and its dead occupant quite close to the entrance to the hole. The trap used was a flat spring-trap, and the animal had only been partially imprisoned. Rats also I have known to drag a trap with a 20-pound weight attached to some hiding-place. Surely this could not have been the work of one individual, and several animals must have been responsible.

In their fecundity these Common Mice are not far behind the Brown Rat, and were it not for the good work of the domestic Cat and our feathered friend the Owl, it is safe to assert that we should soon be overrun with them. The nest is made up of hay, straw, pieces of paper, cloth, and other material, and these latter are usually gnawed into small pieces. The young number from five to seven. They are at first blind, but when about fourteen days old are strong enough to look after themselves. The food is too well known to need mention, as also the extraordinary agility of this common animal.

**Harvest Mouse.**—This small rodent—the whole length, including the  $2\frac{1}{2}$ -inch tail, only being about 5 inches—is yellowish-red above and white underneath. The eyes are not so prominent as in those of the Common Mouse, and other members of the Genus. Beyond this, the body is not quite so plump, and the head is somewhat narrower. In many districts of England this is a common inhabitant, but in the North of Scotland it does not occur. The nest (consisting of coarse

grass) is placed among corn, being attached to a few of the stalks. It is a compact globular structure, well and firmly built, with a hole usually ~~s~~uate on one side. When the female leaves the nest she takes the precaution to close the hole. The young number from five to nine, and several litters are produced during the season. At first these are blind and naked. The food is made up of seeds, insects, worms, etc. Being so light in weight, this most delightful little rodent can with safety climb a corn-stalk without fear of disaster befalling it, and a snap-shot of one saucily mounted at the top of the ears of corn always produces keen enjoyment when shown upon the screen at my Lectures. The bright little eyes and general appearance cannot fail to attract attention. It should be noted that the tail of this species is only partially prehensile. Whilst, when descending a corn-stalk, this appendage is of considerable assistance to the nimble rodent, my near neighbour, Mr. Lydekker, points out that "in possessing an imperfect power of prehension in that appendage the creature is unique among British Mammals."

**Long-Tailed Field Mouse.**—This species, it should be stated, is also known as the Wood Mouse (*Mus sylvaticus*). It is about 8 inches in length, including the long tail; possesses long ears, very long hind-feet and tail. In colour it is bright reddish-grey above, whitish below, with a patch of light brownish on the breast. The hind-feet are white. It is found in almost every part of the British Isles, resorting to fields, gardens, hedgerows, thickets, etc., during Spring, Summer, and Autumn, and in Winter it frequents barns, corn-stacks, and other places. Its diet is a differential one, consisting as it does of acorns, nuts, corn, insects, etc. There seems little doubt that this otherwise interesting little Mammal perpetrates much damage to crops and stores, and its extraordinary fecundity results in its multiplying to an oftentimes alarming extent. An instance is recorded, for example, of two females who in about five months produced between them no less than nine litters, totalling thirty-six young ones, and when it is remembered that these animals commence breeding when only a few months old, it will at once be seen how quickly they

multiply. It is certain that but for the efforts of those nocturnal police, the Owls, and Stoats, Weasels, Kestrels, and other animals, we should be much more infested with these rodents than we are. I have known one Owl, for instance, to swallow nine Field Mice one after the other, until the tail of the ninth stuck out of its mouth, and thus gave ample testimony that it was "full inside." It reminds one in this respect of the last bus home on a wet night! For the Winter respite this species lays up a large store of food during the Summer and Autumn, and as it does not resort to any lengthened period of slumber it requires an amount of food during cold weather. The Winter quarters usually chosen are a burrow in the ground, a disused nest of some obliging bird-friend, or a nest constructed by the Mouse itself. From five to seven young constitutes the litter, and there is often only an interval of about three weeks before a second lot is ready for production! The nest is not only built in the ground, but also in deserted birds'-nests in tall trees. These animals evince cannibalism, like others claiming kinship with them. They will devour their young without much hesitation, and, curiously enough, are stated by a good authority to evince a strong partiality for putty!

**Water Vole.**—I have spent many pleasant hours watching these most interesting animals when I have been a-fishing. I ought, perhaps, to qualify the statement, and write when I was supposed to be a-fishing, for I remember that a great many of my angling excursions were more concerned with the Fauna and Flora surrounding the water than with the finny inhabitants themselves. "Dob, dob, dob," splashed the little Water Voles the whole livelong day. What a happy life they seem to spend, and how pleasantly the time passes when one is watching them! As I have sat upon the bank-side—fringed with Reeds, Watercress, Brooklime, and the most beautiful Forget-me-nots I ever saw—I have watched these Voles swimming from bank to bank; and how entertaining it is to see the wary animal come skidding across the water, head held erect, sniffing as he goes! I make a slight movement, and, presto! "dob" goes the Vole. As I rise to see where the crafty aquatic Mammal has gone to, lo and behold! it is

swimming under water almost to my very feet, and clambers up the bank-side (still under water) and retreats into its hole. The banks of the river I have in mind are fairly riddled with the burrows of these animals, for the latter have held high revel there for many years past. Frequently, and erroneously, called a Water Rat—a name I personally have a distinct abhorrence of—this is a most clean, trim, active, and elegant little creature. The general colour is greyish-brown, tinged with reddish, or sometimes wholly black. The fur is long and thick; the length of the head and body about  $8\frac{1}{4}$  inches; the tail about  $4\frac{1}{2}$  inches. The long hind-feet bear five naked pads upon the soles.

The short neck and head give this little Mammal quite a Beaver-like appearance; the ears are well concealed among the thick fur; the bright black eyes cannot fail to arrest attention, and the tail is somewhat long and slender. This species is well distributed in our country, but does not appear in Ireland. I quite agree with the observations of Macgillivray with regard to its feeding habits being mostly confined to morning and evening, for during midday it seems to remain underground. I have noticed time and time again that, when arriving at my fishing haunt, I have found the water quite populated with Water Voles. Then as the morning has advanced the little creatures disappeared, and did not commence their ablutions again until towards evening. As we found the river on arrival so we left it on departure—namely, given up to the inhabitants of the bank-sides whose habits have caused me so much entertainment. The food is chiefly vegetarian, roots, grass, and other herbage constituting the bill of fare. Often unjustly accused of carnivorous habits, this almost inoffensive animal really does little harm, and the ravages of the Brown Rat are frequently attributed to it.

The litter consists of five or six. These are born during the early Summer, the nest being composed of dry grass and similar vegetation.

It is a most interesting sight to observe this Vole swimming under water, and I can confirm the observation of Mr. Trevor-Battye when he states that it will sometimes make use of its



hind-legs alone when swimming, carrying its fore-paws at its sides, as the Seals do their flippers. When engaged in feeding an interesting sight is presented to the onlooker, for the Vole sits up on its haunches after the manner of a Squirrel, securing the food in its fore-paws. It does not, however, invariably resort to this method of feeding.

**Field Vole.**—This species is sometimes called the Short-tailed Field Mouse, and it must be admitted that to the farmer it is an unmitigated nuisance. On occasions whole hordes of these mischievous pests appear, and at such times the agriculturist is almost at his wits' ends to effectually cope with them. Many instances are on record where the timely efforts of such animals as Foxes, Weasels, Stoats, Owls, Birds of Prey, and others have alone saved the situation, as it were. When it is remembered that thousands of acres of land are shorn of their crops when these ravenous animal hordes appear, and enormous damage done, difficult to accurately estimate, it will be seen that some check is necessary to reduce their numbers. Then it is that the above-mentioned animals are seen at their best—natural balance-keepers, as they undoubtedly are—but few farmers even to-day seem to realise what unspeakable blessings some kinds are. The game-preserve and the agriculturist often run amok, so to speak, and an animal that is of service to one is distinctly injurious to the other. Whilst Owls will undoubtedly take young Pheasants and Partridges, and so bring the wrath of the gamekeeper down upon them, to the farmer Owls are most useful and beneficial creatures, and cannot be too much encouraged. I have said elsewhere, and I say again, that if I were a farmer I would (if I could) have a pair of Barn Owls in every building on my farm, and it is more evident to me than before that every farmer should be something of a Zoologist, and thus become more intimately associated with wild creatures' ways. To hark back to our present subject, the Field Vole is dull greyish-brown above, and greyish-white below. The total length is from 5 to 6 inches. No kind of vegetable matter appears to come amiss to this rodent, the food consisting of various seeds, grass, clover, fruit, roots, berries, corn, beech-mast, turnips, nuts, potatoes, etc.

Their fecundity—like that of the Brown Rat—is remarkable, and when it is stated that they sometimes congregate together in many thousands, riddle the land with their burrowings underground, and destroy almost every living vegetable growth within reach, little wonder will be evinced as to their amazing ravages. When the weather is very hard they resort to hibernation, but on awakening commence to feed with unabated vigour and voracity.

The litter consists of from four to eight, and the nest is placed from 12 to 24 inches below ground. It is lined with the finer portions of hay or grass and moss. Several litters are produced in a season.

Vole plagues—and their sudden appearance—are to be reckoned among the most extraordinary occurrences in the animal world, and the young reader would do well to learn more of these incredible swarms from some authentic source dealing more at length with their remarkable multiplication and movements.

**Bank Vole.**—Whilst generally recognised as less frequent than the common Field Vole, the present member of this Genus (also known as the Red Field Vole) is almost equally destructive, for its diet is made up for the most part of similar ingredients to the last-named. It does not, however, resort to fields and open situations to the same extent, a tangled hedge-bank being a more favoured habitat, whilst gardens are also frequented. It dearly loves the neighbourhood of woodland and young plantations. In the latter much damage is often committed. Various burrows are hewn out by this Vole, and it will also take advantage of the run of the Mole. In its general habits (including breeding) the Bank Vole resembles its relative last under consideration. It is also about the same size, but in colour is rich reddish-chestnut on the upper parts, grey on the flanks, and nearly white underneath. The tail is dark brown above and white beneath. This is a distinguishing characteristic.

**Common Hare.**—This very interesting animal always strikes me as possessing a most curious temperament and disposition—a remarkably shy, alert, much perturbed, and timid

creature. I never chance to observe a specimen without being caused an amount of surprise regarding its curious mannerisms, and there is something connected with its movements and habits which I cannot understand. It is a solitary animal, and this one fact perhaps is sufficient to make us regard it with a certain amount of curiosity and interest.

I usually locate the Hare, by the aid of my strong glasses, in a field some distance away from me, and it is interesting to scan the landscape around from some slight eminence for the purpose of ascertaining if any Hares are out feeding. Evening is a good time to observe these animals, and that they are nocturnal in their habits to a great extent seems to be generally recognised. On occasions I have counted as many as twenty Hares during an evening stroll around their haunts. In my opinion, to see a Hare at some distance away, and watch it careering in a mad sort of gallop across country, is one of the most curious and entertaining sights among our common Mammal folk. On one occasion I was somewhat surprised to find that one of these animals allowed me to almost step upon it before it would move. The effect may well be imagined! I was a good deal more surprised than my wild friend. Away he went, scampering over the field, through the hedgerow, across the lane, mounted the opposite bank, and then on right across country until lost to sight! Whither was he going? Where was his home? Verily these are strange fur people, and their curious antics require a deal of understanding.

The manner in which some animals and birds can, when necessary, take to the water and swim with ease and facility is remarkable. I have known a young Fawn swim across a wide river within a few hours after birth; and a recent experience with a Hare has reminded me to write a few notes on this subject. When some patient disciples of Izaak Walton were plying their peaceful art, a Hare was espied careering madly towards them. The result may be imagined. The fishermen chased the poor Hare, but the animal managed to keep abreast of them for some considerable time. By a series of flanking movements, however, the party eventually almost surrounded the wary creature, and they imagined they had their prize





within grasp. They had, however, reckoned without their host, for, as a last resource, the Hare jumped into the river, swam across to the opposite bank, leaving the anglers on one side standing riveted to the spot in sheer amazement! The animal climbed up the side of the river-bank, and calmly sat down on his haunches and cleaned himself!

I remember, too, an interesting incident with some young Moorhens one summer which comes to mind as I write. We were anxious to obtain a photograph of a Moorhen's nest containing nine eggs. When we reached the nest, the nine eggs were safely located in it; but whilst we were getting the camera ready, four of the nine eggs hatched, and the little fluffy black chicks jumped straight out of the nest into the water before our eyes, with the shells actually adhering to them! It was a thousand pities the camera was not in position so that we could snapshot the sagacious little Water-hens in the act of taking their first plunge, but we managed to secure a good photograph of the remaining five eggs as a memento of this pleasant experience.

The Common Hare varies a good deal in the coloration of its fur, age having much to answer for in this respect. The general colour is tawny-grey above, tinged with rufous, whilst the under parts are white. The large and long ears are prominently tipped with black; the tail is black above and white below. The total length over all is about 2 feet. The young of this animal (called Leverets) are more rufous in colour than the adults.

Mr. Slaytor writes me as under:

"When I was a boy I was once walking down a lane with a terrier, when, hearing a squeak, I found he had caught a baby Hare by the hind-leg. Taking it from him, I carried it home in my pocket, and fed it with new milk out of a teaspoon. It soon became very tame, and, having a garden with a high wall round it, it was never fastened up, and, boy-like, I used to bring it into the kitchen, and introduce it to the Cats and Dogs, and I suppose it liked the warmth of the fire. In the Winter we could not keep it out, and on cold nights it was funny to see a Greyhound, a rough Terrier, and a Bull-terrier and Cat, all

mixed up on the rug with a Hare. These animals generally all slept together in a box by the fire. Some of them had to lie on the other, as the box was too small for them all to have a proper bed, and the Hare always managed to get a top seat, generally on the Cat, the Dogs having the other end of the box."

So that, after all, the Hare is not such a stupid animal as some people imagine! I agree with Macgillivray's remark that this Mammal runs better uphill than down, for when I have been watching it I have noticed time and time again how remarkably well the animal runs up a steep incline. This is accounted for by the fact that the hind-legs are much longer than the front ones.

During the daytime the Hare sits crouched up in its "form," this latter being some situation chosen among various kinds of herbage. It is a sensitive creature, as befits its mode of life, and its powers of hearing, seeing, and smelling are very acute. It is interesting to notice that, unlike the Rabbit, who has his underground runs to resort to, the present species has to rely upon his vigilance and powers of locomotion as a means of escaping from his enemies. The food consists of clover, grass, turnips, and other similar vegetable substances. I am told by some farmers that even in a single night Hares perpetrate considerable damage among growing crops (especially corn), and do far more harm than a number of birds whose bad deeds many people are so fond of recording.

The young number from three to five, and are born with their eyes open. They are soon able to run about and take care of themselves. Sometimes the protective coloration of these animals with their surroundings is very marked, and I have frequently experienced the greatest difficulty in clearly defining the living form of the Hare when the creature has been located upon a ploughed field, so like was its general appearance to the clods of rich brown soil.

**Blue, or Mountain, Hare.**—This species is not quite so large as the Common Hare. The head is smaller and rounder; the ears, hind-limbs, and tail are all shorter. Fulvous grey is the general colour, and the ears are tipped with black,

as in the foregoing species. In the colder regions, however, during Winter the dress is changed to white, with the exception of the black on the ear-tips. The reason for this change will be apparent—namely, protective coloration, for a brown or greyish animal would be a conspicuous object on a white surface.

We do not know this Hare in England, but in Scotland and Ireland it is common. In many of its habits this species resembles its better-known relative. The young are active soon after birth, and this is as it should be in view of the fact that the animal does not resort to burrowing like the prolific Rabbit next to be described. Unlike the Common Hare, however, the present species does not frequent a "form," but skulks among stones, heather, and other situations. During the Summer it seeks the mountain-side, but in Winter it descends into the valleys. It is not so fleet of foot as our common English Hare, and, in regard to its flesh, is not nearly so much sought after as its last-named relative. The furs of both species are of commercial value, and that of the species now receiving attention is frequently sold, after having been chemically treated, in imitation of the fur of more valuable animals.

**Rabbit.**—Last on our Rodents list, but by no means least—at any rate, in point of numbers—comes the Rabbit. Of its general appearance it is not necessary to enter into detail, for those who dwell in our big cities have ample opportunities of observing the same in the shops. Not long since I was noticing with interest the vast number of Rabbits to be seen in various poulterers' and other shops in London, and at one of our large Metropolitan termini I was still further interested to observe many thousands of these extraordinarily fecund rodents. Even although at some distance from the heart of the country—where Rabbits hold high revel indeed—it seemed as if I could not get away from Brer Rabbit on this occasion. Vastly unlike the Hares last described, the Rabbit is a sociable animal, as almost everyone knows. Often on a quiet evening I have counted as many as 300 of them, all congregated close to one another, near a well-known warren, and all busily engaged nibbling away at the grass. In early morning a pleasant hour



or two may be spent among these common wild folk, and I have made many pilgrimages to their haunts in the Spring-time, and never lacked entertainment as a result of their interesting frolics and gambols. I have a strong suspicion that when the wild Primroses are in blossom, and giving to our woodlands that remarkable floral picture which only those who know it can appreciate, the Rabbits nip off portions of the flowers for sheer devilment. I have never seen the point raised before, but I see annually during my wanderings in the wild greenwood some thousands of beautiful blossoms shorn of a portion of their petals. I have often driven or frightened Rabbits away from the plants, and I strongly suspect they are the true culprits. Have my readers any information respecting this pilfering with the petals of the pale Primrose, Shakespeare's

" First-born child of Ver,  
Merry Springtime's harbinger " ?

Shortly stated, the Rabbit's general coloration is brownish-grey, mixed with tawny; white underneath; tail blackish above and white below. It is, of course, a much smaller animal than either of the Hares, measuring about 20 inches, including the tail. Varieties are constantly being recorded, but whilst albino specimens are rare, black specimens are by no means uncommon.

The tail is upturned when the Rabbit is scuttling away as danger threatens. At such time the white colour below is strikingly displayed to view, and this acts as a danger-signal to its fellows. The way in which this species will craftily continue to keep perfectly still when observed in the undergrowth of a wood is simply astounding. I have frequently suddenly disturbed one of the wary little creatures, and it has bolted a few paces in front of me, and then remained motionless. I have often pitched a stone (quite gently, of course) on to the animal's back, and it has still refused to move, and not until I tended my footsteps elsewhere did the sagacious Bunny hie away to safer ground. The protective coloration is remarkable too, and when I have been on my country wanderings with gamekeeper friends, they—the latter—have pointed out a Rabbit

to me skulking in the undergrowth, and, for the very life of me, I could not locate the creature for some little time!

Unlike the Hare, young Rabbits are born blind. Moreover, they are naked and helpless. This being so, it is small wonder that a nest is made below ground, and I have found nests of this animal that would have done infinite credit to many kinds of birds. The hole, or burrow, in which the nest is placed is hewn out by this remarkable member of the Rodentia, and when the young are a few days old, it is a most interesting sight to be able to witness their cosy quarters and their appearance during babyhood. On one occasion I found a nest containing half a dozen young ones that had not long been dead. From an examination made I suspected that a Stoat had seized the mother Rabbit and killed her, and that the young had, as a result, died of starvation. Very often, however, the Stoat is responsible for the decease of the whole family. The wonderful power which the former has when chasing a Rabbit has already been referred to in our biography of that animal.

The number of litters produced annually is extraordinary. Each litter consists of from five to eight young ones, and as these in turn commence breeding on their own account when a few months old, one need no longer wonder at the amazing rate these rodents multiply and overrun the land. Although social creatures and colonising in large numbers, it is interesting to notice that Rabbits are not polygamous, but pair off, and, it is stated on good authority, thus remain for life.

Of the Rabbit's tunnellings and underground dwelling-places, its usefulness for food purposes and its fur, its wonderful fecundity and general habits, it is unnecessary to write. That this animal does an enormous amount of damage is undisputed everywhere, and had it not a number of regular enemies (wild and human), it is certain that in a very short time it would become a much more serious pest than it is to-day.

#### Order V.—UNGULATA

The animals belonging to this interesting order are very few—the Red, Fallow, and Roe Deer solely constituting the three living British species. Indeed, next to the Insectivora, this is

the most poorly represented Order upon the British list. In other parts of the world, however, Deer are present in large numbers and great variety.

**Red Deer.**—This handsome species, which, with the Fallow Deer next to be considered, is such a pleasing feature of many of our English parks, stands about 4 feet high at the withers. The general colour is dark reddish-brown during Summer, but in Winter it changes to greyish-brown. There is a large patch of whitish colour on the rump and short tail. The antlers borne by the male appear when the animal is about seven months old. At first they are straight and of simple construction, but each succeeding year sees the rounded antlers known to most people developing. Eventually the complete antler is formed, and then consists of the "brow," "bez," and "trez" tines (a tine is a spike), and a cup or crown of three further points terminates the ornamentation in a remarkable way. It is interesting to notice that in the third year the male Stag is known as a "Brockett," because of the appearance of a single "brow" tine just above the "burr." Although one may admire the fine antlers borne by some Red Deer of to-day, their appendages are small compared with those that have been grown by their ancestors. The remains discovered in various parts of our country show us that the interbreeding which has taken place, the reclamation of Deer forests, and other causes, have resulted in our present Deer-stock not being possessed of such heavy, large, and pointed antlers, as is evidenced by the remains of their ancestors that have been discovered from time to time. Many kinds of Deer are closely related to the species now under review, and a number are on the borderland of species or varieties; it is difficult to say which with any degree of certainty. In England few places now remain where the true wild Red Deer may be found, and it is in the Deer forests of Scotland where this fine representative of a graceful family of animals must be sought for.

The young of this species are spotted with white, whilst in Ashridge Park, the noble estate of Earl Brownlow, I have observed with interest a white or cream-coloured variety, possessing a flesh-coloured nose, and pale blue or straw





coloured eyes. Fallow Deer may always be seen in the same Park, thus contradicting the idea once prevalent that Red and Fallow Deer could not be kept in the same Park because of disagreement between the two species.

These are gregarious animals, but the old Stags and Does and young divide into two battalions for the greater part of the year, and only consort together when the breeding season is on. °It is in early Autumn that the old Stag commences his love-making, and a very curious one it is, he bellowing out his challenge to a rival in no half-hearted manner, until the mountains and valleys reverberate with sounds strange to those unacquainted with them. If two males meet in conflict the result is often disastrous, the victor proudly stalking off with one of the hinds who have been remaining silent spectators of the love conflict. The fawn is brought forth in early Summer, the gestation period being about eight months. The mother is very solicitous for her offspring, and remains in concealment until the Winter, when she associates with other hinds and young. Only one young one is produced, except on very rare occasions. The antlers of the male are shed in Spring or early Summer, and the point has been raised many times as to how it comes about that one so rarely finds the shed antlers. The suggestion has been made that this is caused by the Deer eating them; and whilst undoubtedly this is true, it is remarkable to observe, as Mr. R. Lydekker states, that for an animal devoid of upper front teeth this must be a very difficult operation.

The food is made up of leaves, grass, beech-mast, young shoots, acorns, and, it is said, fungi. The sight and hearing are both acute, and the animal can swim with ease and facility, even a few hours after birth.

**Fallow Deer.**—As a result of the rows of white spots upon the yellowish-brown body, smaller size, and perhaps more graceful movements, this Deer seems a general favourite, although, it is true, it is only seen by most people in a semi-domestic condition. Sometimes the general colour is uniform dark brown, whilst at others it is milk-white.

This animal stands at least a foot less in height at the

withers than the Red Deer, and claims kinship with an entirely different group of the Genus. It is at once distinguished by the character of the antlers, these being in the present species rounded at the base, and flattened or palmated at what is known as the region of the sur-royals. There is a "brow" and "trez" tine in front of the antlers, and another one at the back, beyond which there are a number of small points upon the posterior margin.

This is not an indigenous ruminant, having been brought over to this country—so it is supposed—by the Romans. Whilst mostly kept in English Parks as a graceful ornamentation to the faunal life of the same, in the New Forest and one or two other places wild Fallow Deer are still to be found, the last remnants of the pure old English (or Roman) stock. Fossilised remains have been discovered in Norfolk of a species closely related to our present one. The general habits of Deer are very similar, and much that has been written of the Red Deer is equally applicable in this case. It only remains to be added that this species is very fond of chestnuts, and that when a Deer raises itself from the ground it follows the habit of the Cow, and not the Horse—namely, gets on its knees first, then raises the hind-quarters before getting upon the fore-feet.

**Roe Deer.**—To most people this species is the least known of the three species upon our list. It is a small Deer, measuring only about 24 or 25 inches at the withers. The general colour is reddish-brown during Summer and yellowish-grey in Winter. There is a large white disc upon the rump. The fawn is yellowish-red in Autumn, whilst it also possesses a number of long rows of white-coloured spots. The Doe is lighter coloured and smaller than the Buck. The antlers of the latter are small, simple, and rounded. They usually consist of only three tines each. The tail is very short. There are no upper canine teeth.

Scotland and two or three of the northern counties of England claim the wild Roe Deer to-day, although in some few woods and forests in other parts of the country perchance some stray individuals may still be found. This is a typical

orest-loving species, and it is interesting to notice that where land has been planted with trees this Deer has taken up its residence in districts from which it had disappeared.

This is not a gregarious animal, like the Red and the Fallow Deer, rarely more than two to four being found in company. The two sexes remain together all through the year. It is an agile creature, and can bound and leap in a wonderful way. July and August is the pairing season, and the two young ones are produced the following May or June. The fawns keep company with their parents until the Winter, and the latter are most solicitous for the safety of their offspring.

#### Order VI.—CETACEA

The interesting members of this Order—comprising as it does the Whales and the Porpoises—do not lend themselves to any detailed study, inhabiting for the most part the waters of the ocean. This being so, it is our intention to concentrate most of our attention upon those kinds of animals that the young naturalist is more likely to come across, and to only briefly mention those kinds which it is necessary should be accorded a place for the purpose of completing our list of Orders. Out of about twenty species of the Order Cetacea upon the British list several are rare visitors, or of only casual occurrence, in our waters, and when we come to reduce the list so as to embrace the few commoner species only, this is all we have left :

- 1 and 2. Common and Lesser Rorqual Whales.
3. Humpback Whale.
4. Bottle-nose Whale.
5. Porpoise.
6. Round-headed Porpoise.
7. Grampus.
8. Dolphin.

The salient features of these eight animals are as under :

#### 1 and 2. Common and Lesser Rorqual Whales

##### (1) *Common Rorqual*

Average length of male : 65 to 70 feet.

General colour : slaty-grey above, white below.



Feeds largely on Fish, and is very fond of Herrings.

Colour of whalebone: slate, marked with yellow or brown.

### (2) *Lesser Rorqual*

Average length of male: about 30 feet.

Greyish-black above, but there is a broad white band across the flippers. White below, excepting on lower surface of flukes, which is greyish-black.

Colour of whalebone: yellowish-white.

Somewhat solitary in disposition.

Both these Rorquals belong to the Whalebone Whales, which include all the larger Whales, and are characterised by the absence of teeth.

### 3. **Humpback Whale**

Average length: about 50 feet. The female is larger than the male.

Distinguished by hump on its back, and by folds of skin along throat.

Colour black; flippers white.

Feeds upon various Crustacea, Mollusca, and Fish.

Easy to capture, being neither timorous nor fierce.

Yield of blubber is small, and whalebone is of poor quality.

At times gregarious, at others solitary.

### 4. **Bottle-nose Whale**

Average length of male: about 30 feet, female less.

May be recognised by truncated forehead and beak-like snout.

Possesses, like Sowerby's Whale, two teeth in lower jaw.

General colour above, nearly black; under surface greyish-black.

Very common off the British coast.

Goes about in schools.

Food: Cuttle-fish.

### 5. Porpoise

Length of adult : from 4 to 5 feet.

Also called the Sea Hog.

Feeds exclusively upon Fish, especially Herrings.

Female bears one calf only at a time.

Possesses a triangular back fin that cleaves the water.

Blow-hole, crescent-shaped.

Colour : blackish above, white below.

A gregarious Cetacean, associating in large "schools."

Fond of aquatic gambols and sports.

Blubber yields oil.

### 6. Round-headed Porpoise

Average length of male : 20 feet.

Also known as "Black Fish" or "Pilot Whale."

Feeds upon Fish.

Has a short dorsal fin ; flippers short and narrow.

Prominent swelling on forehead.

Colour : black above, white below. There is also a heart-shaped white patch beneath the head.

### 7. Grampus

Length of adult : about 20 feet.

Also known as the "Killer."

Feeds voraciously on large Fish and Cetaceans ; dearly loves a Porpoise, and will also feed on Seals.

Dorsal fin long and high.

Possesses sharp teeth in either jaw.

Colour : black above, white underneath ; prominent white patch over the eye.

Has been named the Tiger among Cetaceans.

### 8. Dolphin

Length of adult : about 5 to 8 feet.

Next to Porpoise, the commonest Cetacean we have.

Does not ascend rivers, like the Porpoise.

Numerous teeth in either jaw.

Has a high dorsal fin.

Colour : black, stained with yellowish.

Like its allies, this animal is gregarious.

Feeds upon Fish.

One young one is produced at a time.

This species and the Porpoise were formerly used for the table.

The young naturalist interested in these aquatic Mammals (it is important to emphasise that they are *not* Fish) would do well to further pursue his studies of these remarkable creatures. Many of them yield valuable oil, ambergris, whalebone, and other products. All are quite hopelessly stranded when ashore, and are typical aquatic animals.

They possess wandering habits, and acknowledge no special geographical distribution ; and last, but by no means least, they exhibit much solicitude towards their young—a trait very pleasing to observe among a type of animals of which the average individual knows very little indeed.

Having now surveyed the life-histories of our commoner British Mammals, commencing with the Bats, and ending with the Whales and Porpoises, we may now proceed to deal with the second class of Vertebrates—namely, Birds—as set out in the list on p. 50.

## CHAPTER III

### BRITISH VERTEBRATES

#### Class II.—BIRDS

**P**ROBABLY no branch of Natural History appeals to the general lover of Nature so much as that of Birds. These bright, active, engaging, and animate feathered creatures attract prominent attention by means of their oftentimes beautiful plumage, winning ways, powers of flight, language, wonderfully woven nests, remarkable eggs, devotion to their young, parental instinct, the consciousness of protection of some species (such as the Robin), and their usefulness as insect, weed, and refuse destroyers. Living as we do in such a sensational age, it is essential that, to enable us to combat the cares of business, the mind and body should be relieved and strengthened. The mind needs some solace, the body some life-giving stimulus. And why should we not seek it in the fields and woods? Why should we not go direct to the great book of Nature, and unfold each wondrous page for our enlightenment, education, and recreation?

There are recreations and sports galore, but the devoted field naturalist or sportsman cares naught for such things; he is—or should be—more enthused at the welcome note of even a common bird in the thicket, the uplifting above the earth's surface of the first blade of grass, whilst your British sportsman stalks forth each September after the "wee brown bird," or your patient disciple of Izaak Walton to his favourite nook. Here, if his bag be light he cares but little, for, like Walton, he thanks Heaven for the pure, invigorating country, the sylvan scenes it is his privilege to enjoy.

I mentioned common things. These are too generally overlooked in these days, when competition is at such a height, and every other person one meets has no time for any-

thing. Sir Robert Ball has said: "A whole life devoted to the study of a Daisy would not be sufficient to reveal all the mysteries of its life." Hugh Miller has said: "Learn to make a right use of your eyes; the commonest things are worth looking at, even stones and weeds, and the most familiar animals."

It matters not what branch of wild life one engages in—whether birds, trees, flowers, insects, fish, or, as Hugh Miller says, "weeds"—all have their interesting life-story to unfold.

Tales of the birds! How much I could write, did space permit, of the interesting episodes which have come under my own humble notice, and how great has been the enjoyment I have found in stalking birds and other animals with a good field-glass, and securing a lasting memento of them by the aid of the camera! That intrepid big-game hunter Mr. Selous now finds enjoyment in studying our British birds with a bloodless intention, and, indeed, many sportsmen who have been won over to the use of the field-glass or the camera have told us how charmed they are by the practical pursuit of such a hobby.

During a recent Summer I have been photographing birds and wild flowers, country scenes, and pursuits. The companion of my rambles, although one of the best and most painstaking fellows under the sun, has often amused me by his elementary natural history observations. For weeks after we had started our ramblings he found it difficult to discriminate between a Chiffchaff and a Tree Pipit, a Dandelion and a Campion; but it requires time and no little patience to obtain even a rudimentary knowledge of the furred and feathered tenants of our woods and fields, or the wild flowers which so picturesquely garnish the countryside. But that pleasurable companion of mine I have seen become most interested, and at last enthused and enraptured over some precious photo we have secured of an elegant bunch of Cowslips or Primroses, or a well-defined negative of some nest or bird. The fact is, people who scoff at field naturalists for silly and aimless wanderings know naught of the pleasure and profit of country rambles; the quiet charm of the countryside has no interest or amusement for them, for the reason that they know nothing of it.

One of the very first photographs we secured was a Pheasant's



WATER RAIL





nest and eggs, taken after a veritable hunt for the same, the sagacious keeper having covered over the eggs and twitted us because of being so inexperienced as nest-finders.

How, too, we tramped by the side of that milky-white hawthorn hedgerow in May for the nest and eggs of the Partridge, my friend not knowing, of course, that the parent birds cover the clutch until incubation commences, and how we—the keeper and I—repeatedly warned him of his close proximity to the eggs when, perchance, they were some hundreds of yards away!

These little episodes lend a charm to the outdoor study of birds which those who have not experienced it can hardly appreciate. Well do I remember that lichen and moss nest of the Long-tailed Tit in the furze-bush. How I held down one of the prickly branches to let in the light and enable us to get a better view of it, and how, just as the photographer was about to take off the cap, after nearly half an hour had been spent in making ready, I simply had to let go through the needle-like prickles being too much for my poor delicate hands! How the photographer, in his excitement to again get the nest nicely focussed, caught his almost hairless head in a too-neighbouring furze-top, but how at last our patience was rewarded and a good picture secured.

What interesting traits in birds, too, have been portrayed to view as we have sat and waited for some favourable opportunity at a snap-shot, and how the woodland choir around has sounded more fascinating than when one walks briskly along a country-lane, talking of wars which rage, of stocks which rise and fall, or some other current topic of discourse!

The legitimate sportsman delights in his field-days almost as much, if I mistake not, for the sport taking him out of doors and its attendant attractions, as for the sport it brings; and where, may I ask, in the whole civilised world is there to be found a nobler, kindlier, manlier sportsman than he of British kith and kin? He, as well as the field naturalist, wants change and rest—something which will guard him against an attack of that dreaded ennui, something which will draw out from him his best and truest virtues—courage, manliness and bravado. But, whilst commending the true, legitimate sportsman, and



holding out a friendly hand to greet him, may I commend to my readers the fascinating pursuit of a careful study of the Fauna and Flora of Britain, aided by those useful and profitable accessories, a field-glass, a notebook, and a camera?

The amount of ignorance which still prevails in town and country alike respecting some of Nature's feathered children is very remarkable. For instance, an old country-woman of my acquaintance, who has listened anxiously for the Cuckoo more years than she cares to remember, gave me a wonderfully graphic account of the life of this bird not long since.\* She stated that the young Cuckoo killed its foster-parents, whereupon the male and female Cuckoos took possession of the nest in which their young one had been hatched, and reared the chick themselves! Poor woman! She had certainly got some vague notion of the young Cuckoo's extraordinary habit of ejecting its foster brothers and sisters from the nest in which it happened to be hatched, but her information respecting the killing of the parents was woefully misleading.

This little incident only tends to prove how one may reside in the country for a great length of time without gaining any accurate knowledge of the most elementary natural history facts. It reminds me of an old lady who resided for ninety-seven years in Ave Maria Lane, in the very heart of the City, under the shadow of St. Paul's Cathedral. When asked one day what the building was like inside, she surprisingly replied that she did not know, because she had never been within the doors! And so it is in the country. People simply do not, or will not, use their eyes and ears to advantage, and many stupid superstitions and old folk-tales are permitted to go unchallenged, and the snowball often grows to alarming proportions as time goes by.

It is necessary, then, and indeed essential, that the ardent bird-lover should take every opportunity of becoming on intimate terms of acquaintance with his bird friends. To acquire any knowledge worth possessing, it is of the greatest importance that the young naturalist should strike personal friendships with feathered folks, and learn all he possibly can on his own account concerning them. Regular, systematic,

and careful work always pays, and in Ornithology (the study of birds) new facts and theories are continually occurring to the intelligent student. Thus I recently had ocular demonstration of a trait in the character of the so-called gentle Turtle Dove which illustrates my meaning. Let me tell you of the incident before we pass on :

Kestrels, Sparrow Hawks, and Jackdaws are a great source of annoyance to gamekeepers when the young Pheasants are about; but when going round with a keeper on one occasion, I was very much surprised indeed to see a Turtle Dove swoop down and kill a young Pheasant! The Dove promptly suffered for his depredations, but not until time had been given to see if he would carry his prey away. This, however, he did not do, and seemed to kill the young bird simply for killing's sake. Regarded by the poets as an emblem of faithfulness in love and a bird of a most gentle disposition, this incident clearly shows us the Turtle Dove in an entirely new character. This is the first time in an experience of over a quarter of a century that my gamekeeper friend has had to number this bird among his enemies. Have any of my readers had a similar instance brought under their notice? It opens up such a fresh field in the habits of the Dove that any further information on the subject would be welcome.

The continuous Rambler along the countryside—the practical field naturalist, if you will—who has walked with Nature patiently and lovingly through all the dark and dismal days of Winter, is rewarded early in the year by conspicuous evidence of the coming inrush of Springtide. Although February is not to be trusted altogether, with its fill-the-dyke reminiscences, nor March with its many weathers, yet there is ample evidence in the bird world during February that Spring is in the air! The birds proclaim it, vegetation proclaims it, the latter, perhaps, much more prominently than the former.

The Blackbird—that favourite bird of the poet Tennyson, who has written of it so truthfully and well—has for some weeks past now (we are writing in February) uttered its matin and its vesper song; Song Thrushes are making the woods echo and re-echo with their sweet and varied lyrics; the Great

**Tit**—a fine fellow indeed is the male bird, in beautiful fettle at this season of the year, with his lemon-coloured and black breast-plate—has started uttering his well-known Spring notes, like unto the clanging of a bell, and contrasting pleasingly with the little twitter of the Blue Tit and the sibilous chattering of the Long-tailed Tit, a rarer species in the woodland than either of the two first named.

Another very striking sign in the bird world that Spring is at hand is supplied by the Chaffinch; his "Pink, pink, pink" is of a much shriller description than during the Winter, although, he it said, he has not been entirely voiceless the Winter through, as some writers assert. Directly his welcome song is heard, then may the rambler take heart and prepare for better days. On February 21 of the present year (1908) many Chaffinches were practising their songs. It takes a week or two before they can give forth to perfection the cheery little blast of music, shrill, musical, businesslike; but when once the true notes are uttered, and the sweet and abrupt cadenza at the end of the strain charms the listener, then may he with eagerness peep into some hawthorn hedgerow for the first sight of the moss and lichen homestead.

Stroll leisurely through the woodland on a bright morning in early Spring; notice the alertness of bird life, the chasing of male after female; the ludicrous efforts of the mimicking Starlings; the flurried utterance of the Nuthatch as he eagerly inspects some hole or crevice in a neighbouring oak-tree, where he may make his summer home. Notice how suspiciously the Robin emerges from some grassy bank, and the beautiful brightness of his eager eye; and bring your glasses upon yonder Rookery, and see what commotion ensues amongst the inhabitants thereof. What Spring cleaning, to be sure!

Never have we seen the last-named process conducted with such alacrity and diplomacy. And what a study for an artist's brush—a group of graceful Lapwings on the newly upturned brown earth. We counted over fifty birds all facing the same way, like a regiment of soldiers—stationary, basking in the sunlight, as if this day was indeed a grand parade preparatory to the dismissal of the regiment, each couple then to pair

off and hie away to that favourite field where they have for so many seasons past been known to dwell.

The sunlight resting gracefully upon them, how light-coloured the birds appear on the back—delicate green, white underneath. Watch carefully through those indispensable binoculars. Notice how the black-tipped wings show up when the birds raise the same ready for flight, and how large the birds appear when on the wing as compared to the stationary birds of a moment previous!

**Notes on the Redwing and Fieldfare.**—It is very necessary that extreme care should be exercised in making notes and observations upon birds, as in everything else in Nature. Let me illustrate my meaning.

A West Country reader—for whose observations I have the greatest respect—writes me that during a recent nesting season he thought he discovered a nest of the Redwing containing five eggs. The nest, he tells me, was not plastered inside with mud and rotten wood, as is the case with the Redwing's near relative the Song Thrush, the structure being more after the character of that of the Blackbird. I am assured that my correspondent particularly noticed the red feathers under the wing—hence the bird's popular English name—and that in Somerset the bird goes by the curious name of Windle Thrush. Now, the Redwing is a regular Autumn and Winter visitor to this country, and has never been known to nest among us so far as I am aware. It breeds in Norway, Scandinavia, Eastern Prussia, and a few other countries, and we are told by Dr. Bowdler Sharpe that "all the supposed instances of its nesting in England may be set aside as unauthenticated." Whilst the bird is undoubtedly often confounded with the Mistle and Song Thrushes, I can only add that my correspondent is a splendid field ornithologist, and he makes a point in his notes of emphasising the ruddy-chestnut colour of the under wing-coverts. Personally, I see no adequate reason why some of these fine visitors from the North should not stay to nest with us, especially as they have been observed in Ireland as late as May 10. Further information, however, is required before this species can be admitted as a British

breeding bird, and I invite the attention of my readers to the matter. I recollect, a few years ago, an Irish correspondent writing to me in terrible earnest respecting the nesting of the Fieldfare—another Autumn and Winter visitor to our island home—in the Emerald Isle. I wrote by return for a nest and eggs, and when these reached me, I at once saw that my correspondent had mistaken the Mistle Thrush for the Fieldfare. This being so, for the present at least, I am doubtful whether the Redwing has ever nested in this country, the explanation of the foregoing being, I am afraid, a case of mistaken identity.

**Care in Identifying Nests.**—There is no doubt that the nests of some of our commonest birds are often very deceptive. I have myself seen a nest of the Song Thrush which did not bear the usual mud and rotten wood plaster. I have also seen several nests of this beautiful songster at least twice their normal size, and constructed outside entirely of green moss. Further, I have noticed a nest of this species in which feathers were used, a very rare occurrence indeed. I have a note in my diary, too, concerning the Blackbird's homestead. I found a nest not long since built of fir twigs, and lined with light-coloured oak leaves. If I had not seen the eggs, I should most certainly have been somewhat perplexed as to the name of the owner of the nest. From these few instances it will be seen that great care has to be exercised in identifying some birds' nests, and this is especially the case with some of our smaller species, such as Hedge Sparrows and Greenfinches. Unless the nests contain eggs, appearances are very deceptive on occasions, and it should be the aim of everyone engaged and interested in Nature-study to seek out the truth. All of us, in our humble spheres, may perform good and useful work in adding a link or two to a broken and incomplete chain. It is interesting to notice also how some animals take advantage of the labours of others. Two examples may be mentioned. I found a Blackbirds' nest one Summer tenanted by a Field Mouse, the little animal having constructed a snug home inside that built by the bird. Rambling through a favourite belt of woodland one

Spring day, I espied a little Brown Wren flit from the base of an oak-tree, flying more like a butterfly than a bird on tremulous wings. I listened to its sweet lay—"the lay of the wee Brown Wren," as my friend Mr. Shephard Walwyn has so aptly put it—and then curiosity prompted me to approach the spot from whence the bird flew. I there saw a nest of the Blackbird, and immediately beneath it a well-built nest of the Wren containing several eggs. The latter bird had taken advantage of the Blackbird's homestead, and the base of the last-named structure served as the top of the Wren's neat little home. The two nests were quite joined together, but as to whether both were used at the same time I am unable to say. To have seen both species at home would indeed have been an interesting and unique sight in Birdland.

It is remarkable to notice also how cleverly the Brown Wren contrives to match the surroundings in which her nest is placed. I observed a nest of this bird dexterously built on an oak-tree stump in a hedgerow. The outside of the structure was made up of dead grass, and so wonderfully did it match the oak stump that a very close examination had to be made by some friends who were with me before they could locate the homestead. Another nest of this bird which I observed was placed in a bramble bush. To the uncultivated eye the nest might have been passed heedlessly by as a tangled mass of old blackberry leaves, and a similar remark applies to a further nest of this bird which was built in some dead bracken. The little creature had contrived—and with immense success—to weave some of the dead bracken around its home. I pointed the site out to the companion of my ramble; but, alas! he possessed not the seeing eye, and, after careful examination, declared he could not see anything! Then I told him to stoop low down, and he was thus able to see the little hole towards the top of the nest, and the reader may well imagine his surprise. One day when going through an old gateway, I noticed a hole in one of the posts. I was prompted to tap it, and out flew a Brown Wren. Inside was as snug a homestead as one could imagine! The gate was much used, and every time it was opened it swung to with a bang. Nothing daunted,

the bold little birds safely reared their interesting chicks. As I passed that way on another occasion, I pointed out the strange dwelling-place to a party of Nature-lovers from the Metropolis. They were keenly interested in what they saw, and still more so when—the Wren's family nursery having been deserted—a Mouse craftily poked her head out of the hole and bolted back again for dear life! This is another instance of one animal taking advantage of the labours of another and of a nest serving a double purpose.

The systematic keeping of a Bird Notebook, or Diary, is most useful in building up a whole series of observations upon feathered folk which, when pieced together, present a record of great service. Isolated items may in themselves appear trite, commonplace, and immaterial, but when collated, a most valuable story may, as a consequence, be unfolded.

Supposing, for instance, the young bird-lover makes a point of jotting down notes upon one particular bird during the whole year. He may take any bird that he chooses indigenous to our country and easy of observation—say, the Skylark. Here are some notes from my own Diary written about this bird, and I venture to give them in the hope that many young bird-lovers will follow my example, and keep systematic and painstaking records of the movements and habits of this and other birds.

**Notes on the Skylark.**—The song itself is of so beautiful a description that any attempt to write it down must surely fail. As the bird proceeds in its aerial song-flights, it seems to increase in volume, sweetness and cadence. Right until its final outburst, just previous to the fall to Mother Earth, the bird appears to gather music as it goes. Albeit the song seems little varied, yet it can never become monotonous. Its sweet chromatic lays and trills—call them what you will—uttered as they are during such prolonged and interesting song-flights, always hold me entranced, and no sooner have I finished watching one particular bird alight safely on the ground than I find myself eagerly scanning another bird just ascending, and I have often been entertained for a whole morning in Lark-land alone.

I will now quote a few extracts from my Nature Diary respecting the bird under consideration.

*January 24.*—Miserable Scotch-misty morning, but the Skylark singing in spite of the unpropitious elements. This is the first time I have heard a Lark singing for some weeks. I saw two or three chasing each other over the fallows. The sound uttered as they do this is very musical and clear-ringing.

*January 26.*—The Skylark was soaring and singing deliciously this morning, and the Rooks were up very early.

*February 3.*—The Larks do not seem to relish this return of Winter, and are quite silent again.

*February 17.*—Snow nearly all gone. It is quite nice to see the green meadows of old England once more. I watched with much pleasure a Skylark soaring this morning, and pealing out those beautiful notes we know and love so well. He was soaring in a circular direction, and I believe was endeavouring to attract a female as a partner for the nesting season.

There is, to my mind, much more in this bird language than we can understand, and the deeper we investigate the more mysterious and wonderful it becomes. With the surroundings so damp and dismal, I could not help admiring this courageous Lark pouring out such bubbling music, and the sight and sound did my heart good, and spurred me on for brighter days.

*February 19.*—Very wet to-day, but Skylark singing joyously. I have noticed many times that this bird soars and sings in wet weather, and will sometimes leave off temporarily on bright, sunny days. His song is not always poured forth, as some writers assert, on bright days, and his voice does not always "fall down through the golden sunshine like a flood of sparkling melody."

*February 25.*—Skylarks singing everywhere.

*February 26.*—Raining, but Skylark singing. Why does this bird sing in such dismal weather?

*February 27.*—Raining in torrents, but does not damp the ardour of the Lark. It must be that this continual singing is for a partner.

*March 3.*—I nearly trod upon a Lark to-day: he soared aloft



and sung harmonious music, but what is this bird language? He could not have been happy, because I had disturbed him. We do not understand bird nature any more than we do human nature.

*March 28.*—Skylark singing in spite of wintry surroundings.

*April 11.*—Rained heavily towards evening, but Skylark soaring and singing at 6.30 p.m.

*April 13.*—Skylark singing, and all paired off now.

*April 30.*—Skylark singing more these last few days.

*May 11.*—Skylark soaring and singing at 8 p.m.

*May 19.*—Skylark singing more joyously than ever.

*May 20.*—It has been another day of universal Lark song.

*May 27.*—The first bird sounds which broke upon my ear this quiet Sabbath morning—mornings that give to this fair land of ours a beauty almost divine—were the cry of the Cuckoo, the ever-welcome lay of the Skylark, and the crow of some gay Chanticleer a few gardens off.

*May 28.*—Skylark soaring and singing at 8.45 p.m.

*May 31.*—Skylark still singing. My notes with regard to this feathered musician are very frequent, for the reason that, no matter when I am in or near my house, I can hear half a dozen of these birds pouring out their joyful melodies. They are very plentiful indeed in this district, but, alas for the Nature-lover! the town is rapidly extending its area, and many an old green lane of our boyhood has been effaced beyond recognition. The expulsion of the Larks as neighbours of mine is, I am afraid, near at hand. A year or two will probably see them driven away from their present haunts, for by that time bricks and mortar will have superseded the cornfields, the meadow-lands, and the other rural surroundings—but “sufficient for the day is the evil thereof.”

*June 2.*—The Skylark keeps my spirits up. (It will be remembered that June, 1900, was ushered in by cold, boisterous weather.) He is in incessant song from the time the first rays of the sun flash across the dew-spattered meadows until between 8 and 9 p.m.

*June 12.*—The Skylark, as usual, was towering towards the clouds quite early this morning, singing as beautifully as ever

he did. Is not the singing season of this bird a lengthy one? We will perhaps analyse it later on.

*June 18.*—Skylark singing: no stifling atmosphere, no cold East winds or driving rains damp the ardour of this bird.

*July 13.*—The Lark sings on. I am never at home without a Lark can be heard singing right over my house. How few residents in the district take notice of the little jewel suspended in mid-heaven; but I, for one, admire the sweet-voiced minstrel.

*July 15.*—The Lark was the sole chorister in Nature's choir to-day. Cold and heat do not affect this bird, and that is why he is such a favourite of mine. There, in the broiling sun, the bird could be seen towering up towards the cloudless sky, singing sweet and delicious strains.

*July 29.*—Skylark singing, but not so continuously as it has done.

*August 1.*—The Lark has certainly been very silent this last few days, but a reference to our diary gives us the interesting information that this minstrel has been singing practically without cessation since February 17, and during some part of January. I heard it last on July 29.

*August 5.*—Lark singing, but song by no means well sustained.

*September 9.*—Have not heard Lark singing since August 5. Robin the only bird in song.

*September 14.*—Skylark heard uttering its full song as it was being chased by one or two others—surely uttered in anger or defiance—by no means strong or fully sustained. Only a minute before we had written in our notebook "Skylark still silent!"

*September 16.*—Heard two Skylarks singing to-day, but the song was not well sustained, and the re-assumed song-period has not yet, I think, arrived. Still, hearing the well-known notes again was very welcome, and afforded much pleasure.

*September 23.*—Quite a number of Skylarks have resumed song again.

*October 3.*—Skylarks singing daily, but they seem a tremendous height in the air. I am continually hearing them now, but can rarely see them.

*October 6.*—How the Lark cleaves the air, especially when looked at through a pair of good glasses! It always seems to soar and sing with its head to the wind. Is it not interesting to watch it soaring upward? Taking the glass from the eye, the observer can scarcely see the bird again with the naked eye, as it towers higher and higher, until finally lost in the blue sky. Then it suddenly commences the descent, falling slowly, slowly, slowly, singing all the while, until finally it drops like a stone to the earth in a slanting direction. It is a wonderfully fascinating and interesting sight, and one not easily forgotten.

*October 14.*—Owing to the blustering winds it was only possible to hear a few birds, and the only one singing was the Skylark. He was aloft, with his head to the breeze, singing gaily that captivating song.

*October 30.*—Skylark in full song.

*November 15.*—The Lark is not now in such continuous song.

*November 18.*—Skylark singing *casually*.

*November 25.*—Although such a Spring-like morning, and many hundreds of these birds were to be seen and heard twittering, only a few were actually singing.

*December 6.*—A solitary Lark singing, appearing like a mere speck against the blue and white skyline.

*December 9.*—The most common bird this morning was the Lark. Larks were everywhere and singing joyously. So soon as it was fine and bright the birds ceased singing. Is this not curious?

*December 16.*—Heard the Skylark singing to-day, since which time until the end of the month it has been quite silent.

Thus our extracts cease, and I have devoted so much space to the song already that I must not enlarge.

He who can hear a Lark sing without straining eyes heavenwards to catch a sight of the blithe spirit, as Shelley so ably described the bird, must surely be one who "bath no music in himself." I should add that I have known the bird to sing for forty-five minutes at a stretch, soaring the whole time, and that I have seen it perch on trees, which is a contrary observation to that of most writers.



YOUNG RAVENS THREE WEEKS OLD



TWO YOUNG WOODCOCK

*A young bird, as young as the raven, hatched, with the same parents.*



**A Useful Calendar.**—The careful noting down, year by year, of the appearance and disappearance of our Summer bird visitors, the date birds commence to sing and when they cease, when nest-building begins, the number and colour of the eggs, how long they take to hatch, the food of the young ones, details as to plumage, and many other points too numerous to mention, should all be considered and noted.

As an example of what a valuable series of notes may be made over a number of years, there is set out on the next page a calendar of the arrival of Migrants kept by a working-man friend of mine in Scotland. It will be observed that the birds are written down in alphabetical order, and whilst several years' records are missing—owing to bad weather, illness, and other causes—Mr. Matthew Barr is to be commended for his untiring zeal in keeping a systematic record of the arrival of these feathered ambassadors to his own little parish.

By means of a calendar fashioned somewhat on these lines, and extending over a period of a number of years, it will at once be seen that one is able to strike an average, or mean, date of the arrival of any bird under observation, and thus be able not only to be on the look-out for it at a certain time in a succeeding year, but also to be of some service in providing local records as to the movements of Summer birds of passage.

**Usefulness of Birds.**—The usefulness of birds—and our Summer visitors in particular, these being nearly all insectivorous, or insect-eaters—as destroyers of weed-seeds, insects, and other forms of wild life whose numbers require thinning out, is inestimable. Only those who study animals and plants with a certain degree of intelligence can obtain any adequate idea of their economic value to mankind, and if we take birds alone it is remarkable to notice the good work that they perform. I will give one instance that has come under my own observation.

One Summer I experienced a very pleasant interview with a Spotted Flycatcher. It was towards evening, and I chanced to see the bird near an old garden. There he sat under the thick shade of an overhanging Horse-Chestnut tree. My eyes were

A CALENDAR OF THE ARRIVAL OF MIGRANTS IN THE PARISH OF BEITH, Ayrshire, FROM 1888 TO 1904 INCLUSIVE, AS KEPT BY MR. MATTHEW BARR.

| Name.                                   | 1888.    | 1889.    | 1890.    | 1891.    | 1892.    | 1893.    | 1894.    | 1895.    | 1896.    |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Chiffchaff                              | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      |
| Corncrake                               | May 5    | May 4    | May 3    | —        | April 30 | April 21 | —        | April 27 | April 26 |
| Cuckoo                                  | May 5    | May 2    | April 27 | April 26 | April 30 | April 27 | —        | April 26 | April 25 |
| Fieldfare                               | Nov. 3   | Oct. 20  | Oct. 25  | —        | May 21   | —        | —        | —        | —        |
| Spotted Flycatcher                      | ...      | ...      | May 20   | —        | —        | —        | —        | May 9    | —        |
| House Martin                            | May 8    | May 8    | May 3    | —        | —        | —        | —        | —        | —        |
| Sand Martin                             | May 8    | —        | —        | —        | —        | —        | —        | —        | —        |
| Ring Ouzel                              | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      |
| Tree Pipit                              | May 6    | April 28 | April 27 | May 5    | April 30 | April 22 | April 13 | April 15 | April 25 |
| Redstart                                | ...      | ...      | ...      | May 2    | —        | —        | —        | April 21 | April 28 |
| Redwing                                 | Oct. 14  | —        | Oct. 19  | —        | —        | —        | —        | —        | —        |
| Common Sandpiper                        | April 21 | April 27 | April 19 | —        | April 22 | April 24 | —        | April 20 | April 20 |
| Swallow                                 | ...      | ...      | April 20 | April 26 | April 10 | April 19 | April 14 | —        | —        |
| Swift                                   | May 8    | —        | —        | —        | May 22   | May 3    | —        | May 8    | May 9    |
| White Wagtail ( <i>Motacilla alba</i> ) | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      | ...      |
| Yellow Wagtail                          | April 21 | April 28 | April 19 | April 26 | April 27 | April 22 | April 7  | April 20 | April 22 |
| Garden Warbler                          | —        | —        | —        | —        | —        | May 3    | —        | —        | —        |
| Grasshopper Warbler                     | ...      | April 28 | May 3    | —        | —        | May 9    | —        | April 28 | May 3    |
| Sedge Warbler                           | May 8    | —        | May 3    | May 8    | May 10   | May 3    | —        | May 5    | May 9    |
| Willow Warbler                          | April 29 | April 27 | April 20 | April 26 | April 13 | April 6  | April 7  | April 20 | April 25 |
| Wood Warbler                            | ...      | May 4    | May 3    | —        | —        | —        | —        | —        | May 9    |
| Wheatear                                | April 7  | April 6  | April 6  | —        | March 27 | —        | March 27 | April 6  | April 17 |
| Whinchat                                | April 30 | April 7  | May 4    | May 2    | May 8    | April 22 | April 13 | April 21 | May 2    |
| Greater Whitethroat                     | —        | May 11   | May 10   | May 9    | May 10   | April 29 | —        | May 5    | May 9    |

| Name.                                       | 1897.    | 1898.    | 1899.    | 1900.    | 1901.    | 1902.    | 1903.    | 1904.    |
|---|----------|----------|----------|----------|----------|----------|----------|----------|
| Chiffchaff ...                              | ...      | ...      | May 3    | April 24 | April 22 | April 24 | April 30 | April 29 |
| Corncrake ...                               | April 26 | April 23 | April 27 | April 26 | April 24 | April 21 | April 25 | April 28 |
| Cuckoo ...                                  | April 25 | Oct. 27  | Nov. 1   | Oct. 27  | Oct. 14  | —        | —        | —        |
| Fieldfare ...                               | —        | May 5    | May 13   | —        | May 4    | —        | —        | May 16   |
| Spotted Flycatcher ...                      | May 15   | May 5    | May 6    | —        | April 28 | April 13 | May 9    | May 7    |
| House Martin ...                            | April 22 | —        | April 15 | —        | April 25 | April 13 | April 22 | April 13 |
| Sand Martin ...                             | —        | May 8    | April 22 | —        | —        | —        | —        | —        |
| Ring Ouzel ...                              | April 25 | April 17 | April 23 | April 21 | April 23 | April 20 | April 30 | April 23 |
| Tree Pipit ...                              | —        | May 3    | —        | April 22 | May 11   | —        | May 5    | April 30 |
| Redstart ...                                | —        | Oct. 6   | Oct. 15  | Oct. 19  | Oct. 12  | —        | —        | —        |
| Redwing ...                                 | April 24 | April 17 | April 16 | April 21 | April 15 | April 13 | April 19 | April 14 |
| Common Sandpiper ...                        | April 22 | April 24 | April 23 | April 20 | April 19 | April 13 | April 22 | April 13 |
| Swallow ...                                 | May 1    | May 3    | May 3    | April 29 | May 5    | April 23 | May 11   | May 8    |
| Swift ...                                   | —        | May 6    | May 3    | —        | April 20 | April 23 | April 25 | April 16 |
| White Wagtail ( <i>Motacilla alba</i> ) ... | April 22 | April 23 | April 21 | April 22 | April 15 | April 14 | April 25 | April 16 |
| Yellow Wagtail ...                          | May 16   | May 6    | May 12   | —        | May 19   | —        | May 29   | —        |
| Garden Warbler ...                          | April 30 | May 6    | April 30 | —        | May 14   | —        | May 11   | May 15   |
| Grasshopper Warbler ...                     | May 13   | May 5    | May 7    | May 12   | April 28 | May 10   | May 11   | May 8    |
| Sedge Warbler ...                           | April 17 | April 17 | April 8  | April 22 | April 18 | April 16 | April 25 | April 14 |
| Willow Warbler ...                          | May 21   | May 6    | May 14   | May 12   | May 1    | May 5    | —        | May 21   |
| Wood Warbler ...                            | —        | April 8  | April 4  | March 31 | April 6  | April 1  | March 28 | April 9  |
| Wheatear ...                                | April 3  | April 30 | April 30 | —        | April 26 | April 28 | May 3    | May 19   |
| Whinchat ...                                | April 30 | May 5    | May 7    | May 12   | May 4    | May 4    | May 5    | May 15   |
| Greater Whitethroat ...                     | May 15   | —        | —        | —        | —        | —        | —        | —        |



riveted upon the bird, and the number of times which it left its watch-tower and pursued an insect upon the wing astounded me—so much so, indeed, that I was prompted to count the number of excursions which the agile little creature made. During the first five minutes the Flycatcher flew after and apparently captured ten insects. In ten minutes no less than twenty-six distinct flights were taken, and in fifteen minutes the number had been increased to forty-four separate journeys! My eyes were so strained watching the bird at the end of a quarter of an hour that I had to give up the task of counting, but long after then its efforts seemed redoubled, and I left the bird in an hour's time still busily engaged upon his useful and unceasing work of ridding the air of insect inhabitants. The capture of an insect was accompanied each time by a loud snapping of the bird's bill. Whilst some of the flights were of short duration, others were longer. Sometimes the bird actually appeared to be climbing in the air, using somewhat similar means as a Petrel when it is treading water, if I may be so understood. That is why the last-named is called after the Apostle Peter. It was a delightful little scene in which to participate in the cool stillness of a summer evening, and nought was to be heard excepting the distinct "snap" each time an insect was captured, and just a weak sort of squeaking note which the bird uttered. By the way, is not this Flycatcher a very silent bird during its sojourn among us?

Now and then the male bird was joined by the female, and she—brave little mother!—helped in the fly-catching. Her journeyings to and fro, however, have not been reckoned in my calculations. Now, it is reasonable to suppose that when catching insects at the rate I myself witnessed, the Spotted Flycatcher catches at least forty insects every fifteen minutes it is thus engaged. That means 160 insects are captured in an hour. If we assume—as is quite reasonable—that this fly-catching is undertaken four hours daily on and off, it means that 640 insects are caught by one bird in one day. This is a Summer visitor to our island home. It arrives late in April and leaves in September. For the purpose of carrying our calculations a step farther, and to be on the safe side, we will

compute that the bird is with us from May 1 until September 15—that is, 138 days. A short multiplication sum will thus give the interesting information that one bird alone catches over 88,000 insects during the time it is with us. This is a very moderate calculation, but for the purposes of round figures it is safe to predict that one bird will capture 100,000 insects. Thus it only requires ten Flycatchers to account for 1,000,000 (one million) insects during their sojourn among us! The accuracy of these figures, I make bold to say, cannot be disputed, and it is only when we come to calculate in this way that we can gain any idea of the great usefulness of our insectivorous birds. Results show that, were it not for the efforts of these feathered friends, this country would be a far less desirable place in which to live, beyond which the figures given prove the abundance of unseen insect life around us. When it is remembered that we have between thirty and forty different species of birds which visit us during the Summer, and that practically all of them are insect-eaters, some idea may be obtained of their economic value, not only in ridding the air of insects which would annoy us, but the latter probably carry out great havoc upon every green tree and plant.

The Swallow is another bird which, if an accurate calculation could be made, would be shown to do a good and useful work in ridding us of insect pests, whilst there are a number of Warblers who live exclusively on an insect diet.

It is pleasant to reflect that—thanks to a better understanding as to birds generally and a more intelligent interest being taken in them—many of our smaller birds are increasing. There are, however, several on the verge of extinction—such as the Kite, Kentish Plover, the three Harriers, and others—interesting remnants of a bygone avi-fauna which, once having been lost, it will be extremely difficult to regain. On the other hand, there is a good deal of misapprehension as to the distribution of some birds, as the following will show.

**Notes on Rare Birds.**—In a most interesting and valuable paper in the *Irish Naturalist* entitled “Birds met with on Con-naught Lakes,” the author, Mr. R. J. Ussher, makes the announcement that the Marsh Harrier still lingers on the lonely bogs

beside Lough Corrib, where he has watched it sailing, soaring, and wheeling at no great height. In view of the extreme rarity of this bird as a nesting species, it is pleasing to hear, on the authority of such an accurate and authentic observer of Irish bird life, that this Harrier is still nesting undisturbed in the Emerald Isle. The drainage of the fens, the reclamation of marsh lands, the march of civilisation, the greed of collectors, have all tended towards the diminution of the Harriers, and the time does not seem far distant when all three species on the British list—Hen, Marsh, and Montagu's—will become extinct. It is encouraging to have Mr. Ussher's assurance of the bird still nesting in Ireland; and I understand that Mr. Richard Kear-ton had the good fortune to discover and photograph a Harrier's nest in Surrey during a recent Summer. This is a still more interesting announcement, and we offer our congratulations to the pioneer of Nature photography upon his success. Doubtless, at some future time Mr. Kear-ton will show us a picture of his find, and tell us how he came to locate such an interesting and valuable remnant of Harrier life.

Many people imagine that the Woodcock is a rare bird, but, from Mr. Ussher's paper, we learn that no less than 209 and 211 birds have been killed in one day, in different years, on Lord Ardilaun's estate at Ashford, on Lough Mask, and that as many as 508 Woodcock have been shot in six days by seven guns. I am decidedly of opinion that this bird is increasing its range in England, and I know of more than one locality where Woodcock may always be met with in Autumn and Winter, and make prolonged sojourns until almost early Summer.

As giving some idea of the depopulation that has taken place among our feathered folk within recent years, I have before me a three years' vermin list, obtained at Glengarry, in the Highlands of Scotland, from 1837 to 1840, and from it I extract the bird records as being particularly interesting to readers of this book. The disappearance and total extinction of some of the species is greatly to be deplored, but little wonder can be expressed when such wanton slaughter as this list illustrates was perpetrated at Glengarry alone.

Here is the gruesome list of birds :

|                     |     |                    |       |
|---------------------|-----|--------------------|-------|
| Golden Eagles ...   | 15  | Buzzards ...       | 659   |
| White-tailed Eagles | 27  | Kestrels ...       | 462   |
| Ospreys ...         | 18  | Merlins ...        | 78    |
| Hawks (blue) ...    | 98  | Hen Harriers ...   | 63    |
| Peregrines ...      | 7   | Montagu's Harriers | 9     |
| Hobbies ...         | 11  | Hooded Crows       | 1,431 |
| Kites ...           | 275 | Ravens ...         | 473   |
| Marsh Harriers ...  | 5   | Magpies ...        | 8     |
| Goshawks ...        | 63  | Total ...          | 2,702 |

Of the above-mentioned species the Goshawk is now quite extinct, and the Kite nearly so. A remnant remains of the latter bird, but it is not prudent to mention the locality—it is far too well-known already, and a year or two will perchance see the bird exterminated as a nesting species in the British Isles.

The three Harriers, too, are disappearing from our avi-fauna and there are two or three other species on the list which are fast decreasing, but I need not now continue this pitiable story.

**Destruction of Nests.**—Many correspondents have written me from time to time as to the ruthless destruction of birds' nests and eggs carried out by boys during the Spring and early Summer. Reports of a similar nature have reached me from various parts of the country, and I myself—in those districts I have visited—have noticed the great spoliation which has taken place. I hardly remember seeing such a large number of nests torn from their hiding-places and thrown carelessly down by the wayside as I did in 1908. Beyond this, I have actually seen gangs of loafing youths promenading down some of our country lanes and shooting at sitting birds with that most detestable weapon—the catapult. Several times I have risked a tumult of vile language and a shower of abuse, and have spoken to some of these despoilers. In some instances I was cheered to discover that my words were not spoken in vain, more especially when the culprits happened to be schoolboys. With young men, however, it is different; one hesitates to print it—let alone think it—but it is none the less true, that there are many

young men of eighteen and upwards whose sole object, when walking in the country, seems to be to rob as many birds' nests as they possibly can. Asked why they carry out such unthoughtful, and oftentimes cruel, practices, the answer is usually one of abuse and insult. I have never yet been given a civil answer unless, as above stated, the culprits happened to be not more than fifteen years of age. Why, may I ask, do these country boys and young men rob birds' nests, and generally perpetrate harm along the countryside? I candidly admit I cannot supply any adequate answer unless it be for mere mischief's sake. This destruction is carried out with much so-called bravado; but priding ourselves as we do upon our liberty, justice, courage, and pluck, it seems to me the present generation of young men is becoming considerably degenerated, ignorant, and unkind. It pains me to write thus; I would fain be looked upon as a rabid sentimentalist, but every reader resident in the country will admit, I feel sure, that I have just cause for writing as I do. The education of the young is, in my opinion, the one redeeming feature of this wretched business, and it is most important that greater attention should be accorded to practical Nature-study in our system of education than heretofore. It is pleasing to record that Nature-study is now receiving a place in the curriculum of almost every school in the land. Once a child becomes interested in Nature, half the battle has been won; the interest soon assumes an intelligent character, and this great spoliation of these treasures of the countryside will surely cease when the young lads and lasses of the present age have left school and entered upon the more serious side of life.

This spoliation of the country is not restricted to birds' nests, for I have seen young trees broken down and uprooted, branches broken off, hedges trampled down, and other acts of vandalism too numerous to mention. It is my fervent wish that no undue sentimentalism should be introduced into the pages of this book, but I do plead—with emphasis—with the young naturalist to do his or her part to encourage and protect those wild birds about which no doubt exists as to the good they do and the protection which should

be afforded them. Above and beyond all, wanton cruelty and destruction should never be tolerated for one moment.

**Age of Birds.**—The longevity of birds is a subject deserving close study—indeed, the age of animals generally—and might well engage the attention of the reader. Reference has already been made to this matter in Chapter I., but an interesting note on the subject in *Country Life* is worth inclusion here. A correspondent writes:

“Recorded facts as to the longevity of birds in even the best natural histories are few; it therefore becomes almost the duty of observers to place on record any well-authenticated cases which come under their notice. Ladies of my acquaintance who live at Long Ditton have sent to me the following exact facts relating to a Ring Dove: It flew into their house on Whit Sunday, 1880, from a house adjoining, in which it was hatched in the previous September. It remained with them, and grew very tame and attached to the ladies. Its last moult was not completed as soon as usual, and its feet seemed to give way, so that it was seldom in its cage, but about in the room or nestling on its mistresses. It died on December 20, 1907, being then twenty-eight years and three months old.”

This seems to me quite a hale old age for such a typically wild bird as the Ring Dove, or Wood Pigeon, to attain; but whether, in view of the many dangers which beset the bird in a natural condition, it would have lived over twenty-eight years is difficult to decide. Much remains to be done, however, in regard to observations upon the duration of life of our animal folk, and to this important branch of study I cordially invite the young naturalist's attention. The songs of birds, their nests, and their powers of flight are three very important and entertaining points concerning them. A few notes upon each of these three sections may not be out of place.

**Songs of Birds.**—During February there is no surer sign in the bird world of the coming of Spring than in the outburst of sweet music from the ascending Larks. These choristers of Nature are to be reckoned among the most enchanting of Spring's ambassadors, and surely there are few—if any—young people who can hear a Lark sing

without looking into the blue ether above to catch a sight of the feathered jewel suspended in mid-air. Pride of place must be accorded to this bird in our notes upon birds' songs, for, besides being one of the finest British song-birds, unlike most birds, it sings at least for ten months in the year, as already shown on pp. 133-6.

I always think, too, that out of those ten months I would sooner listen to the Lark singing during February than at any other season of the year. By that time the Larks are busy pairing off; the little companies and flocks which have been wandering about during the Winter are breaking up, and the music in Lark-land—the courtship songs—is striking indeed. Many times during my field studies I have watched several Larks ascending, singing sweet and still sweeter music as they soared airily aloft. These were male birds. Upon the ground I have at the same time often espied some female Larks, intently watching the songsters soaring above them and straining their ears to judge, so it seemed to me, the measure of the male birds' songs. Now, what does all this mean? Simply this: that the finest musician stands the best chance of wooing and winning a partner for the coming nesting season, for you must know that birds' songs, and calls, and cries mean much more than some people imagine. These various songs, and calls, and cries constitute bird language. By careful study of wild life in the fields and woods, highways and byways, ornithologists—those that study birds—have been able to interpret some of the meanings of this wonderful language of the birds. There is a wealth of interesting knowledge still waiting to be added, however, and young people who read this book would obtain a perfect fund of enjoyment by carefully noting bird language.

It is evident to me that many birds' *songs* are uttered for the purposes of (1) attracting a female partner; (2) as a means of cheering the female as she—brave little bird—sits brooding upon her eggs; and (3) as a means of expressing the bird's pleasure and jubilant spirits. Beyond this there is a still deeper and more wondrous interpretation which comes home to me more every time I wander through the wild greenwood or down some quiet country lane, and that is the great debt of

gratitude and thankfulness which we owe to the Creator of these wonderful feathered creatures. I listen to the lay of the wee Brown Wren, and I stand spellbound, and marvel that from such a tiny body, hidden by a mere bundle of feathers, can proceed such a tempestuous outburst of sweet music. It is evident to my mind that no person can become a student of Nature without being most reverential. Emerson, in writing of Nature, said: "Here is sanctity which shames our religions, and reality which discredits our heroes." And again: "The tempered light of the woods is like a perpetual morning, and is stimulating and heroic. Here no History, or Church, or State is interpolated on the Divine sky and the immortal year."

Once more: "Every moment instructs and every object, for wisdom is infused with every form."

**Birds' Nests.**—I have before me a beautiful specimen of a Wren's nest, stitched and woven in a similar manner to that of the Tailor Bird. We often read and hear of the strange places selected by birds in which to build their nest, and also of strange materials used. Probably one of the most costly nests ever built by a bird was found in a watch spring manufactory in Switzerland; it was composed of watch springs. When fishing one day on Girvan Water, a friend of mine found a Sandpiper's nest built in a brow on the water's side; it was the first he had seen. Immediately after he met a keeper, a keen observer of Nature. He told him of his find, and pointed to the spot. He gave a laugh, and said: "It's no' a Sand-tripper's; it's ane o' thae wee Cheepers' nests." My friend replied: "Oh no; come and see." They went to the place, and the keeper, without stooping, pointed to a nest, as he called it; but on stooping down, as directed, he saw the nest my friend had discovered—they were one on the top of the other, and actually touching.

There is one bird in this country which is not a nest-builder—the Cuckoo. This bird is altogether curious, and its peculiar habits have given rise to many speculations as to the reason of its putting (not laying) its eggs in the nests of other birds. Probably the best reasons are that it lays its eggs at intervals,



and that it leaves this country before the young are ready to migrate. It is a shy bird, and erratic in its movements.

The Golden-Crested Wren, our smallest British bird, builds a beautiful little mossy nest, usually suspended like a basket from the under side of a fir-tree branch. It is a nest not easily discovered. The House Martin seems to be decreasing in numbers, and as a result we do not now see the quantity of nests we did thirty or forty years ago, when nearly every two-storied house—at least, in the country—had several nests just under the eaves. Among other causes, I blame the impudent, ubiquitous Sparrow. During our Summer's sojourn in a country cottage, I have regularly to do battle with the Sparrows to prevent them taking forcible possession of every newly-finished Martin's nest. I noticed last year that a pair that had been ousted from their first nest, on building the second made the entrance so tight that they had to struggle into the interior; the Sparrow, being a more bulky bird, was thus prevented from entering. Whether this arrangement was by design or accident I cannot say; it, however, suited the purpose.

The Water Ouzel or Dipper is a very clever nest-builder. It selects some ledge of rock hanging over the shaded side of a burn, where the water is splashing and dripping. It seems to delight in the vicinity of a brawling waterfall, and there it packs a goodly bundle of green moss, with a front and back door. In the case of emergency either outlet is used. In a short time after the nest is built the moss commences to grow on the outside, and soon becomes to all appearance a clump of growing and beautiful moss.

The Swan and many other aquatic birds build large obtrusive nests among rank water-grasses. The Swan's nest is easily seen, especially when the bird is sitting on it; but it is often placed at the top of frowsy, decayed vegetable matter, of such a nature as to prevent an approach either on foot or by boat, all around being a shuddering mass just sufficiently strong to support bird, nest, and eggs.

One might go on enumerating and describing endless varieties and numberless characteristics of bird architecture, based upon

the simplest plans, to superfluous ornamentation, but just sufficient for the purpose and no more. Fashion, as we know it, is not, and yet fashion they have, guided by more inexorable laws than ours. There is so much in bird life that it is not only interesting, but wonderful and delightful, always tending to elevate and refine our nature. Give it a little attention; it will repay you.

There is an old saying that when one is choosing a site for a house a neighbourhood where there are many birds' nests should be selected, as it is always a salubrious spot, with, usually, picturesque scenery. It is, unfortunately, only the privileged few who can do this. Wild things are being gradually pushed into preserved and protected lands; were there not such retreats for them, our country would soon lose many of its finest charms.

**The Flight of Birds.**—There are a great many features in bird life suggestive of the ideal in beauty, colour, and motion. Few, if any, birds are repulsive; nearly all their characteristics are of the better sort—beauty, grace, dignity, courage, form, daintiness, and mobility. Their structure and habits fit them for a high life; they have such clean, open eyes and timid look, innocence, trust and fear blended together, ever ready to leave *terra firma* and mount to their privileged sphere of existence.

There are several kinds of aquatic birds which really fly under water. One can see this in the Zoological Gardens, London, where there are large glass tanks in which the birds can be seen diving, and while under water using their wings the same as in flight. This procedure is adopted when they are pursuing fish.

Most people accustomed to an open-air life and observers of Nature can tell almost any bird by its flight, but it would be difficult for the average man to describe how one bird differs from another in this respect. Scientists have, however, closely observed the motion of birds' wings, and this is their classification:

**Gliding flight:** A sort of sliding over the air with fixed wings, practised by Pigeons and Swallows.

*Rowing flight* : Progression by the ungraceful flapping we see in Ducks, Geese, Partridges, and Pheasants.

*Soaring flight* : Sailing with occasional flaps, as in the case of Hawks and Eagles.

*Sailing flight* : Using the wind alone and going' along with it, as a barge goes with the stream. Vultures, Albatrosses, and other large, heavy birds move about in this lazy way.

*Hovering flight* : Remaining fluttering over a fixed point, as Humming Birds and Skylarks do.

Some birds have wings, others have pinions. There is something in the sound of the word that suggests an easy, dignified, undulatory movement. A bird with pinions does not propel itself along by sheer force of muscle, after the plebeian fashion of the Crow, for instance, but progresses by a kind of royal indirection that puzzles the eye. Even on a windy wintry day it rides the vast aerial billows as placidly as ever, rising and falling as it comes up towards you, carving its way through the resisting currents by a slight oscillation to the right and left, but never once beating the air openly. As Burroughs describes this beautiful and wonderful way of flight, this superabundance of wing power is very unequally divided among the feathered races, the Hawks and Vultures having by far the greater share of it. They cannot command the most speed, but their apparatus seems the most delicate and consummate. Apparently a fine play of muscle, a subtle shifting of power along the outstretched wings, a perpetual loss and a perpetual recovery of the equipoise, sustains them and bears them along. With them flying is a luxury, a fine art ; not merely a quicker and safer means of transit from one point to another, but a gift so free and spontaneous that work becomes leisure and movement rest. They are not so much going from this perch to that, as they are abandoning themselves to the mere pleasure of riding upon the air. Little wonder, then, that man has a longing to find some means of ascending upwards, and, when there, being able to steer and direct his course in the air. We enjoy many privileges, but that of flying has been naturally denied us. Such a desire has been fostered and fed by writings in both sacred and secular books, in which reference is so often

made to beings of a higher order than man having powers of transporting themselves from one sphere to another by means of wings. This, of course, is mere sentiment. If ever flying becomes universal, it will be by means of some mechanical contrivance, which will take a great deal of the romantic freedom out of it.

It is wonderful how deftly the Blackbird and other smaller birds can alight on the top of hedges or shrubs, at once secure a footing and manipulate their feet while hopping, shifting, and turning round among leaves, twigs, and branches of various shapes and thicknesses. No doubt the flicking of their wings assists in this process. Birds are the gold and silver in Nature's animated pictures. No poet or writer on Nature can overlook them. They cross and recross his line of vision, and when not delighting our eyes by their pleasing movements in the air, we are charmed by their sweet song, or interested in their sympathetic chirp, or note of surprise or alarm, giving zest to our walks in bypaths, lanes, and out-of-the-way places, considered desirable, because our own kind is seldom seen there. Lowell, the American poet and writer, says one of the most delightful books in his father's library was White's "Natural History of Selborne." Now, Gilbert White was one of the greatest lovers of birds; none has written more minutely about their ways, their times of coming and going, their nesting and song.

The study of birds is almost an instinct in this country. In all classes an innate affection for the feathered songsters seems to prevail, so that whether it be in stately aviary or in a little cage outside a cottage door, birds are found to be the constant companion of man. Probably no other country in proportion to its size possesses such a number of birds as Great Britain. Anyone travelling on the continent of Europe cannot fail to notice how few birds are seen, especially in France. And then we have such a variety, many staying with us all the year round, others visiting our shores during the Winter months, others coming to enhance the charm and beauty of our Spring and Summer months. Had we our choice whether we should like our migratory birds to stay all the year round with us, we

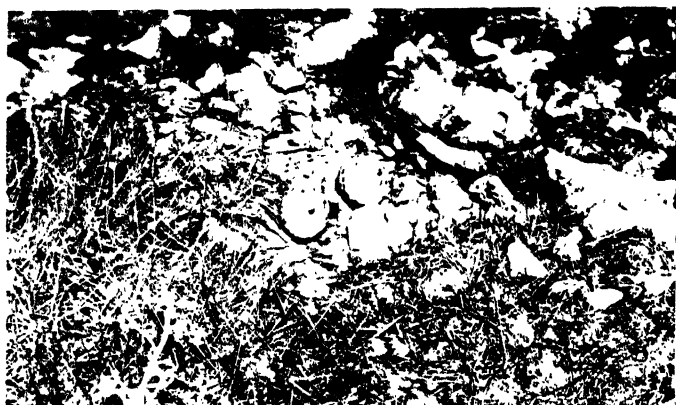
would unhesitatingly say no. Go, and God speed you on your journey to a far-off land, there to cheer and brighten the woods, fields, and gardens in other lands. We shall be ready to welcome you back when beautiful Spring comes round again.

Man makes pets of many living things—some domesticated and tamed, others which are free to come and go. The latter are by far the most charming, when once you have gained their confidence, even if they have made one's acquaintance through necessity. The friendship is maintained by confidence; wild things do not become pets through ignorance or simplicity, but by intelligently realising what to fear and what to trust. I have during my life had many birds and other animals under my care, but none pleased me more than a bird which, at a certain call and whistle, came flying fearlessly and alighted upon my outstretched hand. For two years our friendship continued, at the end of which it disappeared. When alighting on my hand the dainty touch of its tiny feet caused a thrill of pleasure and a feeling of sociability with the charming family of birds.

The wee, modest, dumpy Water Ouzel has a straight whirling flight; it does not undulate much, hence its flight is well adapted for its mode of life—flying and steering its way among the roots and overhanging boughs of trees, alighting now and again on a half-submerged stone, then to nod and dip its body, showing off its dusky jacket and white waistcoat, which is always spotlessly clean.

The Owl, having the under parts of his wings covered with soft, downy feathers, renders the action of them noiseless, the better to flip-flap and glide along the hedgerows, looking out for the Mice it preys upon. It is said that if let loose in a room in the dusk it can fly round and round without being heard by the human ear. Seen front on, it has the appearance of a cherub—a head, face, and two wings; but on a closer inspection one sees "no cherub is he."

The Greenfinch has a short, sharp flight when on the wing, uttering two or three cheery, tinkling notes of such a kind as to merit its character—"the merry Green Linnet." When rising on the wing it shows its beautiful olive-green or archer's green





## BIRDS

shoulders, its chrome-yellow rump, and the strongly marked black band on the margin of its tail feathers.

The Nightjar, not altogether an uncommon but not a well-known migrant, is in its flight similar in some respects to the Owl. Its downy plumage, its colour, and its noiseless flight resemble the Owl, but it is much quicker in its movements. It is not often seen, as it spends the day in some dense plantation. In the evening its chur-r-r-r-r may be heard a long way off, but in such a way that one imagines it is quite near at hand. Persevere as you may, you find a difficulty in locating its position, and should you succeed in this you will find a difficulty in getting a sight of it. I remember once seeing a fight between two Nightjars; noiselessly they fought for a short time, sometimes on the wing and sometimes tumbling among a bed of flowers. After it was over, I found a few feathers which had been shed in the scuffle. When pursuing insects, the bird sometimes comes down to the ground with a flutter, quickly ascending again. It has the thinnest skin for its size of any bird I am acquainted with.

The Swallow family are considered to be *the* birds of flight, being almost continually on the wing; their powers of continuous and rapid flight are highly developed, and their internal organs, bones, and muscles are specially adapted for rapidly changing from high to low flight, and *vice versa*. They must have some quick-acting arrangements apart from the wings to carry out such variable movements. They seem to have a power of suddenly emptying the hot-air sacs in their bodies, thereby reducing their buoyancy so as to descend rapidly, and of refilling those cavities to increase their buoyancy, thus assisting the wings in producing upward and downward movements. This would apply to the rising and falling of birds in general, especially in the diving powers of the Gannet, also the quick stooping and diving of Hawks. Swallows can fly past and skim lower and closer to an object without touching it than any other bird. See how rapidly it feeds its young—a stoop, a flutter, a touch, and it is gone, in pursuit of more insect food. The feet of Swallows are so dainty and tender that they mostly perch on small twigs—a favourite perch being



telegraph wires—and when perched they are continually hobbling to keep themselves from toppling forward, their feet and legs being placed nearer the tail than most birds. As Burns says in “Bess and her Spinning-Wheel”:

“The Swallows jinking round my shiel  
Amuse me at my spinning-wheel.”

The Snipe, another quick-flying bird, has a habit when rising from the ground of flying in a zigzag motion. It continues in this mode of flight for a short time, when it gets into a steadier flight. At certain seasons it goes high up into the air, and when flying along now and again utters a booming sound, then breaking into a series of bleats, something like the Sheep or Goat. While doing so it descends so far, then ascends to the level it left, somewhat like the dip and rise of the letter V. It is, by reason of this peculiarity, called the “Heather Bleat.” The booming sound is the same as its now rare cousin the Bittern makes.

Birds which fly in flocks, such as the Lapwing, Starling, Snow Bunting, and others, give a very striking and effective display of accurate evolutions. Now they turn and glide in the air, wheeling about and almost coming to a halt, then a graceful swing and a turn. If it is a sunny day you can see the pretty changes as they turn their backs, sides, or under parts to the sun, now silver, now grey, like a large invisible net studded with living gems, each held in its proper place, and all well drilled and skilled in keeping their positions. No jostling, no collisions! To see this, let anyone during the Winter months watch the flight of the Snow Bunting.

In writing on the flight of birds I have selected a few of our best known birds, but before passing on let us glance at our smallest British birds—the Blue Tit, Brown Wren, and Golden-Crested Wren. These three birds, though adepts at hopping, creeping, and climbing, are not strong in flight. They make a short spir-r-r-r from one place to another. On alighting they immediately commence climbing or hopping, often creeping, side or head downwards, on the hunt for insects, larvæ, or eggs.

**London's Feathered Folk.**—Whilst the resident in the country has undoubtedly the best opportunities of studying our wild birds, it is most remarkable to note the wealth of bird life to be seen and heard in and around the Metropolis, more especially if one carefully observes the many species of birds which make London a halting-place during their migration, or which casually pass over, or through, the greatest city in the world. To the majority of people the Sparrow, the Pigeons, the Starlings, a Thrush or two, a cheery Robin, and a sooty Blackbird, constitute practically the whole of London's feathered folk, but to those possessing the seeing eye a greatly increased avi-fauna is presented. I know, for example, of one keen observer in South-East London who has recorded no less than seventy-seven different species, ranging from the smallest bird in Europe—the Golden-Crested Wren—to the Ring Dove or Wood Pigeon, many larger species of birds nesting in a semi-domestic state in the parks and open spaces being eliminated. As a visitor to the Metropolis, I have been myself amazed at the variety of feathered folk to be met with. I remember meeting with the Greater Whitethroat on one occasion in the very heart of the City. What led the bird in question to gaily disport himself in Basinghall Street I could never imagine. Probably the strange wanderer had been blown out of its course by adverse winds during migration movements, but it seemed little the worse for its visit to the haunts of the City Fathers, and after I had examined it, it flew away as if nothing had happened. Certainly this most interesting bird seems more at home when observed along some green Hertfordshire lane, with its frail nest secluded in a bramble-bush. I have often been highly entertained by the male bird's ludicrous and excitable movements. He will mount on the topmost spray of a hedgerow, chattering all the time, and then as you approach he will fly into the air, dance like a coquettish butterfly, and then dash down excitedly and utter with much vehemence his notes of defiance! Should you be fortunate enough to find the homestead, notice particularly how noiselessly the bird slips off her nest. Let the bramble or rose-bush be never so thick and impenetrable, the crafty bird-

sprite manages to hie away without the slightest noise or rustling of any kind.

I have often admired the stately gait of the Pied Wagtails and the Chaffinches in some of the London Parks. The latter, too, has often entertained me by his rapturous song as, entirely oblivious of his surroundings, he perches on some tall tree and utters his music to the accompaniment of the lumbering noise made by a passing omnibus, cab, or other vehicle. Londoners should be particularly proud of this feathered guest appearing in their midst, for he builds one of the most beautiful mossy cradles imaginable. Excepting, perhaps, the Long-Tailed Titmouse, the Gold Crest, and the Goldfinch, the nest of the sprightly Chaffinch must certainly be regarded as the most beautiful example of avian architecture performed by any British bird.

I was very surprised one Spring day to notice a pair of saucy Magpies playing hide-and-seek near the Broad Walk in Regent's Park. I had only a few moments previously been watching a female Ring Dove sitting contentedly upon her two white eggs, and listening to the male, perched on one of the trees, cheering on the brooding dame. "Don't scold so Sukey, Don't scold so Sukey!" cried the male Wood Pigeon in clear, unmistakable voice. A great many people were passing right within sight of the bird, and within sound of his typical wild greenwood cry. Not a soul, however, appeared to notice the bird, either by sight or sound. It is much the same in the country. Time and time again I have watched a soaring Lark, and listened to its delightful minstrelsy. I alone have stopped to listen and to observe, except on very rare occasions.

Many kinds of Water Fowl nest in the London Parks where there is a supply of water. Most of these have, however, been introduced, such as the Mute Swan, the magnificent Black Swan of Australia, the Widgeon, Wild Duck, and other species. Wild Swans, Geese, Waders, Ducks, etc., pass over, nevertheless, during rough weather. Mr. Holt Macpherson, for instance, one of London's most systematic and accurate bird recorders, writes in 1904 that "On November 24 snow was lying, and I observed a Linnet feeding on the ground near

Hyde Park Corner. As I returned home from my walk upon that evening, a large number of Waders were flying high over the Serpentine; they were apparently considering whether to alight. It was quite dark, and the birds were, of course, invisible; but, as far as I could judge, several species were present, Redshank being the most prominent."

It is especially pleasing to notice the great amount of interest which the Gulls afford to Londoners during the Winter-time. It speaks well for the city dweller to note that these typical sea-birds increase in number year by year, and thus appreciate the protection afforded them. How interesting to watch the eager throngs which gather daily along the Embankment and in the parks to feed the bird visitors, and to note how solicitous even the most sordid of the human gathering are for the protection and preservation of these strange feathered folk. The Black-Headed Gull is the most frequent visitor during Winter-time. At that season it is entirely different to the bird when it is in the full breeding plumage, the blackish-brown head being lost after the Autumn moult. This is one of our commonest Gulls. It does not resort to the coast to the same extent as others claiming kinship with it, breeding around the margins of inland waters, on bogs and other situations. In his full nuptial dress this Gull is a handsome fellow indeed, and visitors to the Zoological Gardens will have noticed, perhaps, how vociferous he can be when occasion requires. When being fed, too, the deft birds tumble and scream in a half-frenzied manner, and seem to afford the lookers-on an interesting source of unalloyed pleasure.

It is astonishing to notice in passing some of the rarer birds which visit London. In this connection we may mention the extremely recluse Grasshopper Warbler; the Spotted Flycatcher, who loves an apple orchard all to himself; the trim Wheatear, who delights in the solitude of the Sussex Downs; the Common Sandpiper, who hies away to the moorlands and to the hills of Scotland; the Reed Warbler, who makes his home in some reedy swamp; the shy Blackcap, who dearly loves a shady copse where the Wild Hyacinths carpet the ground with a belt of blue; the Willow Wren, who usually

inhabits the topmost branches of the tallest trees in an oak wood, and yet builds its nest upon the ground; the handsome Redstart; the Sand Martin, who nests in colonies in a sandpit in the soft banks by the opal sea, or the bank of some river; the Garden Warbler, who is a great lover of oak woods, and one of our finest song-birds; and that feathered mimic and British mocking-bird, the Sedge Warbler.

Even that shy bird the Little Grebe may be seen on the Round Pond in Kensington Gardens, and before March is out the delicate little Chiffchaff may be heard heralding his arrival. The Wryneck, or Cuckoo's Mate or Messenger, rings out his "Pee, pee, pee, pee, pee," and the Nightingale may be heard at several places during the season of the year. They have, indeed, been known to nest in London. Two nests were discovered by a friend of mine a few miles from Charing Cross during 1908. I have myself observed the useful Lapwing very near London's border, and a friend of mine has noted this typical country bird near Hackney, as well as the Snipe, the Ruff, and other comparatively rare species. The cheery Robin Redbreast must perforce be included as one of the chief of London's feathered folk. No bird receives so much protection, and Bobby well deserves the favours conferred upon him, for, beyond his interesting habits, delightful song, companionship, and handsome attire, he is a most useful bird, and does nobody any harm. Several representatives of the Titmouse family make London their home. The Blue Tit is a frequent visitor to the gardens of the Metropolis, and his clever antics on the suspended cocoa-nut husk, meat bone, or lump of suet, cannot fail to entertain and amuse all those who cater for the birds during hard weather. The pugnacious Great Tit is a London resident, too, and it is interesting to watch the feathered acrobat hanging head downwards, as he is wont to do, or to listen in the Spring to his bell-like love-song. He is a handsome fellow in his full nuptial plumage, and even among the smoke and smuts contrives to appear spick-and-span.

The speckled Mistle and Song Thrushes, the sooty Blackbird, the trim and elegant Hedge Sparrow, the Swallow, the House Martin, the Swift, the Grey Wagtail, the voracious Greenfinch,

and even that typical bird of the moorland, the Meadow Pipit, are all to be counted among the feathered folk of London. The little Brown Wren (often confounded as the female Robin Redbreast) frequently turns up in most unexpected places within the London area, and the azure-blue Kingfisher, the darting Jay, one or two of the Woodpeckers, the Nuthatch, the Tree Creeper, the Goldfinch, the Bullfinch, the Jackdaw, the Nightjar, the Yellow Bunting, the Hawfinch, the Stonechat, the Skylark, the Corn Bunting, the Coot, the Yellow Wagtail, the Whinchat, the Lesser Whitethroat, the Heron, the Rook, the Carrion Crow, and other species, have all been authentically recorded either within the Metropolitan area or just beyond the border. In the Brent Valley Bird Sanctuary at least twenty species of birds have been known to nest, and over fifty different species have been recorded. Here they are afforded every protection, and a most excellent series of photographs, obtained by Mr. Wilfred Mark Webb and Mr. Hubert H. Poole, the secretary and librarian of the Selborne Society respectively, were exhibited in 1908 at the annual conversazione of this most deserving Society, and caused an amount of interest.

The fine Herring Gull, the Red-Backed Shrike, the Redwing, the Sparrow Hawk, the Tawny Owl, the Moorhen, the Fieldfare, and the Tern have been observed not far from Hyde Park Corner and in other parts of the Metropolis. When it is remembered that a great many of the birds mentioned in this brief survey not only occur in and around London during migration, or through stress of weather, but regularly, year by year, build their nests and rear their young within the London area, it will, I think, be generally admitted that Londoners possess a wealth of bird life, if they will only cultivate the spirit of observation, the seeing eye, and the receptive ear. Truly, those whose good fortune it is to live within hail of the green fields, the wild greenwood, the country lanes, the marsh, the moorland, the vicinity of the farmyard, and other rural retreats, have better opportunities for observing the bird population. On the other hand, the many thoroughly authentic records which we possess are amply sufficient to convince all

those interested in the bird life of our country of the variety and comparative abundance of London's feathered folk.

**Points in Bird Study.**—There are many other points that may be mentioned in connection with an intelligent study of the bird life of our land, and, whilst it is not possible for these to be elaborated upon, I heartily commend them to the notice of the young naturalist.

1. How and why birds are classified, and the distinguishing characteristics of each order and family.

2. The adaptability of birds to their environment.

3. The number and colour of their eggs.

4. The wonderful variation in the shape, size, and general structure of their nests.

5. Our Summer visitors: how and when and why they come; how and when and why they leave, and where they go to.

6. The distribution of birds, and how suited the various species are for the habitats they choose.

7. Object-lessons of industry, cleanliness, and devotion to the young.

8. Solitary and gregarious birds.

9. Place occupied by birds in the economy of Nature.

10. How some birds occupy the position of natural balance-keepers.

11. Generally, the fund of interest and amusement and recreative occupation that may be obtained as a result of quietly and unobtrusively observing the wealth of bird life found in the British Isles.

**British Nesting Birds.**—Our British nesting birds are divided into fourteen Orders, starting with the largest order of all, the Passeres or Perching birds, and ending with the Pygopodes.

There are about 180 different kinds of birds nesting regularly in Great Britain and Ireland. Of these about forty are Summer visitors, only coming to our country from foreign climes (and Africa in particular) for the purpose of nesting. Then, again, when the Summer birds have gone, we have during the Autumn and Winter a large influx of visitors from the North of Europe, who either proceed farther south than our own island home, or who make our shores their permanent

Winter quarters. Some representatives of these nest with us, but a great many of them are Winter visitors only. Of these we shall treat in the concluding pages of this chapter.

Whilst there are, as stated, about 180 kinds of birds nesting with us at the present day, many of them are exceeding rare, such as the Kite, Bearded Tit, the three Harriers, the Kentish Plover, the Roseate Tern, the Dartford Warbler, the Chough, the Merlin, the Hobby Falcon, etc.; others, again, are shy and recluse species, or nest on inaccessible islands and elsewhere, and are not likely to come under the notice of the young naturalist. This being so, it has been thought best to concentrate chief attention upon those birds which, under fairly favourable conditions, the young naturalist should have little difficulty in locating as opportunity offers. A diligent search must, however, be made for even the 100 odd species about to be mentioned, as these are distributed in a number of different districts. Birds which inhabit the woodland, such as the Woodpecker, Nuthatch, Tree-Creeper, Wryneck, Pheasant, Chiffchaff, Willow and Wood Wrens, Jay, Magpie, Nightjar, Owls, Heron, Rook, Hawks, Ring and Turtle Doves, and others, must be sought for in their favourite woodland haunts. Birds such as the Snipe, Dunlin, Redshank, Sandpiper, Grebes, Moorhen, Coot, Kingfisher, Dipper, Marsh, Reed and Sedge Warblers, and Ducks, tenant rivers, lakes, and other water, whilst sea birds of many kinds will be found inhabiting the Sea and Seashore. Some sea birds will be observed where no rocks are present; others will only be found where there is a rocky stratum. Some birds love the sand, others the shingle. Some birds are fond of hedgerows and lanes, such as the Chaffinch, Buntings, Robin, Greenfinch, Partridges, some of the Tits, Bullfinch, several of the Warblers, Tree Pipit, Blackbird, Song Thrush, Wren, Red-Backed Shrike, Hedge Sparrow, and so on. Birds like the Skylark, Meadow Pipit, Wheatear, Whinchat, Curlew, Golden Plover, Lapwing, Linnet, Stonechat, Wagtails, and Grouse, frequent meadows, fields, commons, heaths, or moorland. Birds such as the Swallow, House Martin, House Sparrow, Swift, Starling, and others, as is well known, frequent dwelling houses, outside



buildings, etc., whilst in large gardens and parks many kinds of feathered folk may be located by the intelligent and zealous worker. Although, it should be emphasised, there is, in the case of some birds, no hard-and-fast rule as to the exact habitat—the Cuckoo, for example—the devoted young naturalist who has acquired a fair amount of knowledge of the habits of birds should be able to ascertain without much difficulty the bird life of a given district.

There are exceptions, it is said, to every rule, and on occasions birds will turn up in most unexpected quarters. This adds a charm to ornithological study, and acts as a stimulus to always be on the alert in the expectation of adding yet another bird to any local list that may be in preparation. There is a great and good work to be done in the future regarding both the Fauna and Flora of various localities. Careful, systematic records of the inhabitants of both faunal and floral worlds might well engage the attention of societies and individuals, and one has only to mention the splendid work accomplished in a restricted district by such observers as Gilbert White, of a bygone age, and my good friend Arthur Paterson, the well-known East Coast naturalist, of the present.

We may now proceed to set out the salient features of the commoner birds that nest in the British Isles, leaving the young student to work out for himself the many other traits in their character. The poverty of our own notes will be apparent as the reader observes for himself the life histories of these feathered creatures; but it is admitted by many of our greatest scientific men that the work of one individual in the realm of natural science can never in any way be complete. It is with a view of stimulating the personal study of our bird friends that the following brief notes are given, for by this means the young naturalist will be encouraged to pursue his own studies, and find out on his own account—the only real pathway to success—many details of an interesting and entertaining nature that are not here recorded.

COMMONER BIRDS THAT NEST IN THE  
BRITISH ISLES

## Order I.—PASSERES, OR PERCHING BIRDS

**Mistle Thrush.**—This is a handsome bird, and exceeds by 2 inches in length its relative next to be described. It is a slight upon this bird to call the Song Thrush *the Song Thrush*, as the Mistle is a good singer, even if his notes are louder and not of such a sweet and varied description as those of the former.

It is one of the earliest birds to sing and nest, and as it frequently utters its notes very early in the year during rough weather, it is often referred to as the Stormcock. Woods, orchards, and large gardens where there are tall trees are much frequented. The nest is a substantial structure, and is often completed by February. It consists of fine grass and straws, moss, and lichens. There is a layer of clay, but this is covered over with grass and fine fibres. The nest might be mistaken for that of the Blackbird. It is placed in the fork of a tree, and never, so far as I am aware, in hedges, laurels, banks, etc., as in the case of the Song Thrush and Blackbird. The greenish-white eggs are spotted or blotched with chestnut and clove-brown, and number four or five. The food consists of insects, worms, snails, slugs, berries, and fruit. The plumage is ash-brown above, white underneath, with a yellow tinge and many prominent spots of black. Length, 11 inches.

**Song Thrush.**—Whereas the Mistle Thrush is 11 inches in length, the present species measures 9 inches only. Undoubtedly this favourite bird is one of our chief and best songsters. It will often sing on a Winter's day, and always commences early in the year. Its notes possess great variety, and many of them are very beautiful. That it is a great songster all who love bird music agree. Towards evening in the Spring the chorus of the Thrushes and Blackbirds in Southern England has a wonderful effect when listened to during the gloaming hour. The nesting season commences in March, sometimes earlier, and two broods at least are reared

during the season. Evergreens, hedgerows, bushes, among ivy, on the sides of trees, banks, and even upon the ground, are some of the situations chosen. The nest is built of coarse grass (sometimes moss) and twigs. The inside at once identifies this bird's nest, as it is well lined with rotten wood and mud. This is quite soft when the plastering takes place, but soon hardens, and makes a good and neat finish to a firm and compact structure. Five eggs are usually laid, and these are bright blue, spotted or blotched with black, brown, or chocolate. The food is the same as that of the last-named. The bird is known also as the Mavis and Throstle. It is olive-brown on the upper parts, white on the centre of the throat, ochre-yellow on the neck, sides and underneath, spotted with dark brown. The legs are long and the eyes lustrous.

**Blackbird.**—Another fine songster. The notes are mellow, rich, and vesper-like. Sometimes they strike the ear in a more gladsome strain. There is neither the richness nor the variety of the notes of the Thrush. The nesting haunts and the food resemble those of the latter. The Blackbird, however, is not so partial to snails. Whereas Thrushes congregate in flocks during Winter, the Blackbird never does, and is solitary and bachelor-like in his habits. The nest is similar to that of the Thrush, but is lined with fine dry grass. The four to six eggs are greenish or bluish-green in ground colour, marked with black or brown spots or patches. This bird has long been known as the Merle. The sobre-clad male in his handsome black plumage is well shown off by his rich orange bill. The female does not possess such black plumage, and is more like a dark-coloured Thrush. It is an inch longer than the Song Thrush. The young are darker than those of the latter bird, but are spotted in a somewhat similar way. The young males do not assume the adult plumage until after the first Autumn moult.

**Ring Ouzel.**—This is another member of the Thrush family. It resorts to moorlands and places of solitude, and is a Summer visitor only, arriving in March or early April. It resembles a Blackbird, excepting that the male possesses a large crescent-shaped spot of white upon the throat, and white edges on the feathers. The female is greyer, and the white spot is neither



SONG THRUSH AT NEST



NEST AND EGGS OF SONG THRUSH



NEST AND EGGS OF BLACKBIRD



FEMALE REDSTART

so white nor so large as in the male. The nest is similar to that of the Blackbird, and is placed on a steep bank, or among a tuft of heather or grass, or amidst moss. The four or five eggs are similar to those of the last-mentioned bird, but, if anything, they are more boldly marked. The song somewhat resembles that of the Mistle Thrush: it only consists of a few notes of a clear description; the bird is very pugnacious, and very chary of interference. The usual Thrush diet is partaken of.

**Wheatear.**—Another bird resorting to desolate places, such as downs, mountains, heaths, and moorlands. It is an early Summer migrant, arriving about the end of March. The male is a very handsome bird in his bluish-grey and white plumage, and is one of the few British birds that shows a prominent white patch on the rump when flying. In this respect may also be mentioned the House Martin, Jay, and Bullfinch. In the Autumn the plumage is reddish-brown, whilst the female is ash-brown and yellow. The male has a prominent white eye stripe; that of the female is dingy. Length of bird,  $6\frac{1}{2}$  inches. The nest is composed of dry grass, bents, wool, moss, and hair. It is placed among, or under, stones or clods, in walls, on moors and mountains. The four to six eggs are pale greenish-blue, and are sometimes faintly spotted. This is an insectivorous bird, and it utters a soft, agreeable song, which is accompanied by absorbing love flights during the breeding season.

**Whinchat.**—A later arrival among us than the Wheatear, this bird should be sought for on furze and other commons, heaths, uncultivated lands, and other similar places. It arrives in April or early May, and the nest is built on or close to the ground. It is well concealed, and composed of coarse grass outside, finer inside, straw, and moss. On occasions fibrous roots and horsehair are also utilised. The four to six eggs are blue, and neither so bright nor so large as those of the Wheatear. A low warbling and persistent song is uttered, which reminds one of that of the Redstart. In many districts this bird is known as the Furze Chat. The male is dusky brown on the upper parts, edged with reddish-yellow; over the eye is a prominent

white streak; white on neck-sides and throat; neck and breast bright yellowish-red; large spot of white on wings and base of tail; yellowish-white on belly and flanks. Female not so gaudy, and white wing spot smaller. Length,  $5\frac{1}{4}$  inches. This is another insect-eating species.

**Stonechat.**—The two birds last described and the species now under consideration all strike one as very restless and solitary. The present one chooses a furze common<sup>\*</sup> as his chief haunt; but I have noticed, also, that he is a very common bird on various parts of our coast where bushes are found. It seems a more trustful species than either of its relatives, and has the attractive habit of almost invariably perching on the topmost branches of a bush. The male is a handsome little fellow, and far different to his less gaudily-attired mate. He has a jet-black head, throat, and eyes; white on rump and neck-sides; bright chestnut-red breast, inclining to whitish on the belly; black back, wings, and tail edged with reddish-brown. The female is dusky coloured above, with yellowish-red edges to the feathers. She has a black throat, spotted with white and reddish; dull red breast; less white on wings and tail. Length,  $5\frac{1}{4}$  inches.

Unlike its two relatives last described, this is a resident bird, although in some districts of England it is partly migratory. April or early in May sees nesting operations in full swing, and in June I have seen the young birds strong on the wing. It is an engaging sight to see them flitting from bush to bush accompanied by their parents. The nest, like that of the Whinchat, is difficult to locate, and is placed upon the ground. The base of a bush is a favourite site. Dry grass and moss are used, with a neat lining of hair and feathers and sometimes fine grass. From four to seven eggs are laid, and these are pale bluish-green, with a faint red circle of spots at the larger end. Sometimes they are unspotted.

Insects constitute the food. Although the Stonechat does possess a low, sweet song, the more general note is a complaining one, which becomes somewhat monotonous, and is uttered with great persistency. When hovering this bird is very attractive, appearing in the act of alighting more like a

butterfly than a feathered creature. When watched it is almost incessantly upon the move, and appears at all times an engaging and active bird.

**Redstart.**—This bird resorts to far different localities to those recently under review. Some quiet wood where there is an open space, an old garden, or a park, are very favourite haunts. It is an unobtrusive and recluse bird, and must be sought after with diligence. If not watched until it gives flight, and thus discloses the bright-coloured tail feathers, it would often be overlooked. Closely examined, the male is a really charming bird, having a white forehead, bluish-grey head and upper part of back, black throat, bright bay breast and tail, the two centre feathers of the latter being *bright* brown. When flying with the tail spread, and just before alighting, the effect of these two tail feathers is very beautiful to notice. The female is grey on the upper parts, with a noticeable tinge of red; she has whitish on the throat and belly, and pale red on the breast. Length,  $5\frac{1}{4}$  inches.

It is interesting to notice that the Whinchat, Stonechat, and Redstart are all the same *length*; but *from my observation of living birds*, it seems evident that, taken over all, the Redstart is the largest and the Stonechat the smallest. The Wheatear is the largest of the four. Of captive birds or dead bodies I know nothing. Another Summer visitor, the Redstart arrives sometime during mid-April. A hole or crevice in a decayed tree, a hole in a wall or outbuilding, or in an old post—such are a few of the places which I have known this bird to choose for a nesting site. The homestead is composed of dry grass, roots, and moss, lined with feathers and hair. The five or six eggs (I have found seven) are quite small and pale uniform blue, often very pointed at one end. They are smaller and much lighter in colour than those of the Hedge Sparrow, and are certainly the smallest of any of the four birds whose life-histories we have recently considered. This is another insect-eater, and does incalculable good in this respect. It is not a great singer, the song being best described as low, soft, and sweet. In a way it is somewhat of a mimic, as one can detect the notes of other birds in its song.



**Redbreast.**—A general favourite everywhere, the Robin endears itself to mankind because of its consciousness of protection and preference for companionship. The general characteristics of this common and much-loved bird are too well known to need detailing. It should, however, be pointed out with emphasis that the male and female birds both possess red breasts, and it is most difficult to discriminate between them. The young birds, however, are spotted like Song Thrushes, and are often mistaken for them. The red breast—so characteristic of the Robin—is not assumed until after the Autumn moult. Perhaps, if anything, the female is a trifle smaller than Cock Robin, and her breast is not quite so cherry-red. The plumage on the upper parts is olive-brown, and the belly is whitish.

This bird always appears plump and well-groomed—so much so, indeed, that as it has a long appearance, surprise may be expressed when it is stated to be  $5\frac{3}{4}$  inches long only. It is a useful bird, and a pair I had under observation in my garden caused me much astonishment as to both the variety and the amount of food that they consumed. Spiders, Earwigs, Earthworms, Butterflies, Caterpillars, Daddy-long-legs, and a whole host of miscellaneous creatures, were brought by the male bird wherewith to feed the female upon the nest and the young birds. I noticed, too, that no matter how cram-full of food the cock bird's mouth was, he was still able to sing a song of cheer to his sitting mate, evidently to the effect that he was coming along with a fresh supply. The nest is placed in all manner of curious places, such as a grassy bank, among ivy, in old kettles, cans, and tins, on the ledge of a shelf in an outbuilding or even in a house, in old coats, sacks, and baskets, flower-pots, and other situations too numerous to mention. The roundish eggs are whitish in ground colour, faintly freckled with light brown or red. The usual number is five or six, but I have found seven, and on one occasion located a nest containing six Robin's eggs and two of the Pied Wagtail, eight eggs in all. At least two broods are reared during the year, the first early in the season. The nest is exceedingly neat, and composed of moss, grass, dead leaves



ROBIN AT NEST



EGGS IN NEST



(these are very favourite materials), with a lining of roots, wool, or hair.

The bold antics of the Robin, its curious habit of bobbing up and down like a feathered jack-in-the-box, its habit of coming to our gardens during Autumn and Winter, and its mellow, flute-like song, are all salient features of this well-known bird. The Autumn song is to my mind the most welcome. • At that season few birds are singing. Nesting operations are at an end, and the notes of the Robin—although plaintive and perhaps tempered with sadness—are very welcome. The same remarks apply when the song is heard on a Winter's day.

The bird utters a curious click-click-click note of its own accord, as well as a monotonous weeping note when one is in the vicinity of the nest. Besides these, a curious hissing noise is made when the young are being fed. From the number of Robin's nests which I find forsaken, or in which the eggs have been sucked, during my country wanderings, I am of opinion that various Field Mice, and perhaps the Weasel and Rat, take toll from the nests of this bird in the early Spring, when birds' eggs are scarce. The Robin, however, is a very persistent nest builder, and if disturbed will at once commence operations elsewhere.

It is a solitary bird ; it is very pugnacious and very quarrelsome. It does not appear to quarrel so much with other species as with its own kind. Pitched combats often take place, which result very frequently in death to one of the fighters.

**Nightingale.**—All our song birds are included in the Order Passeres, and despite the hue and cry which one so frequently hears as to the dense human population that this country harbours, we still possess some of the very best songsters in the whole world. Among these the Nightingale holds, of course, a very prominent position. It has no serious rival perhaps in the whole world. I know of no other bird capable of uttering such remarkably clear, full-throated notes, such a passionate outburst of living music. At the same time, I am in agreement with those who state that the song of this bird

has been much overestimated. As a result, many of our song birds, such as the Blackcap, Garden Warbler, Skylark, Song Thrush, Blackbird, Willow Wren, Goldfinch, Tree Pipit, Linnet, Woodlark, and Wren, are not nearly so much lauded. Incomparable as the Nightingale's song is, there are harsh notes to be distinguished by the careful listener; the notes are somewhat ear-splitting when listened to close at hand, but beautifully softened by distance, and the song period is of comparatively short duration. Reaching us in mid-April (the males coming first), the bird almost at once gives voice, and sings on incessantly until the end of May. After then the volume of song becomes appreciably less, and when June is well on it almost ceases. I am a great lover of this day as well as night singing bird. I admire its long-drawn-out notes, the "jug, jug, jug," the rising and falling, the soul-inspiring music; but in view of the restricted song period, and the great amount of attention that has been given to the bird, I feel constrained to cast my vote in other directions—for the Skylark, Garden Warbler, or Song Thrush, perhaps—if asked to record my feelings with regard to any particular song bird. These comparisons of the songs of birds, however, need not be made, for each and all in their way have their own particular fascination, and no two are exactly alike.

The Nightingale frequents woods, copses, hedgerows and lanes with a thick undergrowth, and quiet gardens. It loves to hide its nest at the base of some thick bush, or among a tangled mass of herbage. It is usually placed on or near the ground. A certain identification of the nest of this bird may be made by the dead oak-leaves that are used in its construction. Dry grasses, roots, and other materials are also requisitioned, and the structure is deep. The four or five eggs are olive-brown or dull greenish-blue, and quite unmarked in any way. Many people, I know, on seeing the bird for the first time, have expressed keen disappointment at its plain and sober appearance, losing sight of the fact that birds possessing powers of song are, as a general rule, soberly clad. The vocal effort is, in the opinion of some persons, one of the chief means possessed by a plainly-clad bird for the purpose of attracting a

female partner. The Nightingale is chestnut-brown above, with a rufous tail and greyish-white under parts. With the exception of the rufous tail and larger size (it is  $6\frac{1}{4}$  inches in length), this bird might be mistaken for a Robin without a red breast. Indeed, in many of its habits it much resembles the better-known bird. When young are in or out of the nest, the parent birds utter a plaintive note, followed by a harsh "krrrrrrrr," and if the observer remains quiet when the young ones are able to fly, but have not left the company of their parents, he will be rewarded by a close inspection of this usually shy and recluse species. The food is entirely insectivorous.

**Greater Whitethroat.**—A happy-go-lucky bird, a fussy, busy little body, is an apt character for the Greater Whitethroat. This is a bird of the country lanes and commons where bushes abound. It has a curious habit of fluttering in the air in a jerky, hesitating manner, rising and falling, and singing all the time. It reminds one of a bird being pulled up and down by an unseen wire, a coquettish, passionate little creature who hates to have his quiet fastnesses penetrated by even a young and ardent naturalist. The notes uttered are somewhat thin and harsh, although on occasions I have heard this bird singing really well. When in the vicinity of the nest, a harsh note of defiance is uttered in a perfect torrent, and if the bird be watched it will be seen to be greatly agitated and perturbed.

We have a Lesser species of Whitethroat, so that our present subject has been aptly named the Greater. It is commoner than the smaller kind, and during the past Summer (1908) I have been gratified to notice a considerable increase in its numbers. It has an ashy-grey head (the feathers of which it has the habit of raising into a sort of crest); a white throat, which gives the bird its name; reddish-brown back, white underneath, with a faint tinge of rose colour. The female lacks the last-named. Length,  $5\frac{1}{2}$  inches. This is another Summer visitor, arriving about mid-April, a little previous to its Lesser relative. It dearly loves a bramble or wild rose bush in which to secrete its frail homestead, but nettles and

grasses are equally favourite resorts. Fine grasses are utilised, and a lining made of hair. The eggs number five or six, but exhibit a good deal of variation. Greenish-yellow in ground colour, blotched, spotted, or mottled with ash-grey or brown, may be given as the general rule. In some country districts it is called the Nettle Creeper, Haychat, Haytit, and Peggy Whitethroat. It has the habit of slipping off the nest in a most quiet manner, apparently so as to escape detection. The nest is shallower than that of the next species, and is usually placed much lower down. Insects and a little fruit constitute the diet.

**Lesser Whitethroat.**—I believe that this bird is often overlooked, because it is not at all well-known, and shows itself much less than the Greater species. I am also of opinion that the Lesser Whitethroat is much commoner than is generally supposed. This last two years I have myself noticed quite a large number of these birds where I did not think they previously haunted. The bird must, however, be listened for, as much as it must be looked after. It is a shy species, and contrives to hide itself in a very perplexing manner. The note, or song, if such it can be called, is, however, unmistakable, and the young bird-lover would do well to make himself acquainted with it. The song is started—and, indeed, finished—in a high-pitched key, and ceases as suddenly as it commences. It consists of a succession of notes of little, if any, variation, and the singer is of a very restless and roving disposition. The situations chosen for the family nursery and the food are similar to the Greater kind. The nest, however, is much deeper, and, in addition, grassbents, the stalks and down of other plants, and spiders' webs are used. Roots also are utilised, with hair for a lining. The eggs are vastly different, and cannot be confused with those of any other bird. They are quite small, white in ground colour, speckled with ash or light brown, mostly at the larger end. The plumage is smoky grey and brown above, white underneath. Length,  $5\frac{1}{4}$  inches. Some curious local names have been given to the species, such as Brake Nightingale, Jack Straw, and Babillard.

**Blackcap and Garden Warbler.**—A favourite bird to those who know it, the Blackcap is to be numbered among



NEST AND EGGS OF BLACKCAP



CHIFF CHAFF GOING ON TO NEST



PLATE XXX



our best songsters. Many people consider it little inferior to the Nightingale. Personally, I do not consider these comparisons desirable or permissible, but if my opinion was asked I should unhesitatingly cast my vote on behalf of the bird next to be described—namely, the Garden Warbler. The Blackcap's song consists of a series of bubbling notes, some beautiful and rich, some not nearly so sweet and attractive, some thin and scratchy. The distinguishing characteristics between the songs of this bird and the Garden Warbler may here be given. These are not very marked, and only the trained ear can be certain of discriminating between the songs of the two birds. A knowledge of their haunts and their habits will also be of inestimable service. The Garden Warbler's song, then, appeals to me because of the rich flute-like notes, the continuous rhythm of the mellow strain, the entire absence of the thin, somewhat scratchy, Whitethroat-like notes of the Blackcap, and at times the incomparable loveliness of some of the better and best utterances. The Blackcap mostly resorts to thick bramble and rose bushes in wood or lane, and is rarely seen at any great height. Both birds are difficult to locate. The Blackcap skilfully conceals himself in some embowered retreat; the Garden Warbler (a much misnamed bird this) contrives to hide his body behind and beneath thickly-foliaged oak and other trees of the woodland, and is usually observed at some height. Whilst the Blackcap will, if quietly watched, gradually work its way to the outside branches or the summit of a bush, and seems to sing for the joy of the thing, the Garden Warbler is almost incessantly searching for food and singing at the same time. It rarely shows itself, and often and often I have heard a bird quite close to me which for all the gold in the world I could not for the life of me locate. I have paid considerable attention to the songs and habits of these two birds this last few years, and still have a great deal to learn concerning them. I have satisfied myself on some points, however. One is that the Garden Warbler is quite the better songster of the two, and by far the commoner bird in the districts in which it is my privilege to carry out my studies of our feathered folk. The song, it may be, is a matter of

opinion and of choice, but I have found out with surprise that many people are totally unacquainted with the song of the Garden Warbler, and few persons, indeed, appear to know it in any way. Both birds are Summer migrants, and arrive at about the same time in April. The nesting haunts are also similar, so also are the nest and, in a manner, the eggs. The haunts chosen are bramble, wild rose, and other bushes, low hedges, thick shrubberies, thickets, and gardens. The nests are frail structures composed of dry grasses, fibrous roots, and similar materials. Fine roots and hair serve as a lining, whilst wool and cobwebs are sometimes used.

The four to six eggs of the Blackcap are dirty white in ground colour, blotched, spotted, and streaked with dark brown. The egg varies a good deal, and a handsome rufous variety is much sought after by collectors. The four or five eggs of the Garden Warbler are muddy yellow or yellowish-white in ground colour, stained and spotted with greenish-brown, lighter or darker. Insects, berries, and soft fruits constitute the food of both birds. The Blackcap has been named the Blackie Topper, Guernsey Nightingale, and Mock Nightingale, and the Garden Warbler possesses the local names of the Nettle-monger, Fauvette, Passerine Warbler, and Greater Pettychaps.

Plumage of Blackcap: Male, greyish, with a black head; female, reddish-brown cap, and somewhat browner generally. Length,  $5\frac{1}{2}$  inches. Plumage of Garden Warbler: Greyish-brown, with an olive tinge; an ash-grey patch below the ear; dull white throat; grey breast and flanks, with a tinge of rust-colour; white on remaining under parts. Length,  $5\frac{1}{4}$  inches. When hunting for food, or stalking through the foliage or undergrowth, the Garden Warbler has the habit of carrying its head well forward, and crouching, whilst the Blackcap—and the male particularly when engaged in singing—raises the feathers of its black head into a kind of crest. The young observer of birds would do well to pay particular attention to these two species, and if he succeeds in obtaining the fund of interest and pleasure I have done, as a result of my personal inquiries into their home life, I can promise him ample repayment.

**Golden-Crested Wren.**—This, the smallest bird in Europe, *must be looked and listened for if success is to be obtained.* It is an active little species, and resorts very largely to fir-trees, where the thick foliage both hides the bird and its beautiful little nest. This latter is composed of moss, lichen, fine grass, spiders' webs, and a profuse feather lining. The eggs, as might be expected, are very small. Six to ten are laid, and these are pale yellowish-white, with a dull light reddish-brown zone at the larger end. The song is weak but pleasant, a series of sibilous notes which the ear must be well trained to hear. The bird is insectivorous, and dexterously searches for food among fir and other trees. In colour it is olive, on the upper parts tinged with yellow; cheeks ash-coloured; bright yellow and orange crest, bounded by two lines of black; yellowish-grey below. The female is duller in colour, and the crest is lemon. Length,  $3\frac{1}{2}$  inches.

**Chiffchaff.**—This is one of the earliest feathered ambassadors of Spring, arriving during March. Some of these birds are, however, resident in a few parts of England all the year through. The bird appears to return to the same haunts season after season. It is very partial to oak woods, and, like the Willow Wren, next upon our list, haunts the topmost branches of tall trees, but builds its nest on or close to the ground! The food is made up of insects and their larvæ, and these it will often capture, like its near relative, in the air after the manner of the Flycatcher. The two notes are shrill and resemble the bird's name—"chif-chaf, chif-chaf, chif-chaf"—and these are uttered very persistently. The bird also emits a strangely plaintive note, similar to the Willow Wren and the Nightingale.

A grassy bank near a wood is a favourite nesting site. The nest is almost dome-shaped, and consists of dead grass, leaves, and moss, with a wealthy lining of feathers. The six eggs are white and roundish in shape, speckled with dark purplish-red. The bird is olive-green above, with a yellow tinge; there is a faint stripe of yellowish-white above the eye, and the same colour prevails on the under parts. The leg feathers are greyish-white. Legs black. Length,  $4\frac{3}{4}$  inches.

**Willow Warbler.**—A much better songster than the

**Chiffchaff**, but resorting more or less to the same haunts, and of similar habits. It has been called the piccolo soloist in the bird orchestra. The notes are light, plaintive, musical, and sweet. The song begins in a high-pitched key and gradually descends, until it is almost finally lost in the music of the woodland choir. When the birds first arrive in April, the woods often resound with the delightful chorus. Then it is that the Willow Wren is heard to the best effect.\* The nest, site, and food are similar to those of the last-mentioned species, but the eggs are different. They number five to seven and sometimes more. These are white, freckled profusely with light red. This last few years I have observed that this bird often places its nest at the base of a small, thick bush among grass. The plumage is olive-green above, tinged with sulphur-yellow; a broad streak of the latter is present above the eye; bright yellow on sides of head and throat; remaining under plumage white. It is a trifle larger bird than the Chiffchaff, being about 5 inches in length. Legs bright reddish-brown.

**Wood Warbler.**—This is not nearly such a common bird as either the Chiffchaff or the Willow Wren. It is fond of beech woods, but does not exclusively resort to same. It delights in some dark retreat in the woodland, and loves solitude. In a favourite haunt I recently identified at least six pairs of these birds and listened to the curious song. This I noted down as under: a plaintive, non-musical "chooe, chooe, chooe," and a shivering "cho-o-o-o-o-o-o." This is a poor rendering, I am afraid, but it is difficult to syllabise the notes of birds, although perchance easily understood by those conversant with them. Even when the Wood Wren is close at hand it is difficult to see, especially as it does not appear to be an active species. In this respect it does not bear comparison with either of the two last-mentioned birds. I am of opinion this bird is not so uncommon as is generally supposed, partly on account of its sedentary disposition and its inconspicuous utterances. It does not resort to such a height as its congeners, but builds its nest upon the ground. This is similar to those of the Chiffchaff and Willow Wren, but is to be at once distinguished by the absence of feathers. It arrives among us later than its

two relatives mentioned, rarely making its appearance until the end of April or early May. The five to seven eggs are white, well spotted and speckled with dark red-purple mostly towards the larger end.

The plumage above is olive-green, with a tinge of sulphur-yellow; a broad streak of the latter is present over the eye; bright yellow throat and sides of head, as also upon insertion of the wings; pure white on remaining under parts. Length, nearly 6 inches. A male Wood Warbler seen under favourable conditions is a really beautiful bird, and much more gaudily attired than either the Chiffchaff or Willow Wren.

**Reed and Marsh Warblers.**—If a favourite haunt of these two birds can be located, they will probably be found in profusion. A friend of mine discovered some thirty nests of the Reed Warbler on a small eyot on the Thames. Briefly, the two birds may be summarised thus:

The plumage of the Marsh Warbler is more olive-coloured, that of the Reed Warbler being more rufous. The songs are similar, but that of the Marsh species is the sweeter of the two. In some respects, both birds' songs resemble the utterances of the Sedge Warbler, but are not so powerful. They are similar to the last mentioned, however, in possessing the habit of starting singing when one intrudes into their fastnesses. Both birds are late arrivals, and it is not until the end of April or in May that the journey from Africa is concluded.

The Marsh Warbler lays from five to seven eggs in a nest composed of dry grasses and moss. The lining is made up of horsehair, whilst on occasions a dead leaf, wool, or spider's web are utilised. The ground colour of the eggs is bluish-white, sometimes with a green tinge. The latter is obscured by two sets of blotches, the fainter ones pearl or violet-grey, the more prominent brown or purplish-black.

The Reed Warbler has a smaller clutch of four or five eggs, and these are greenish-white, spotted and dashed with green and pale brown. The nest is deep, composed of dried grasses and aquatic plants, as well as leaves, moss and wool. It is attached to the stems of reeds in a very ingenious manner.

Whilst the Marsh Warbler lives exclusively upon insects, the Reed Warbler varies this diet with, it is said, soft fruit and berries. Both birds are difficult to study, being shy and recluse in their habits, and to a great extent nocturnal.

The Marsh species was for some time confused with the Reed Warbler, and it was not until 1861 that the former was definitely identified by Mr. Saville. This occurred in Cambridgeshire. Dense reed beds and marshy localities, the margins of rivers and swampy places, thickets close to water, may be mentioned among the nesting haunts of both kinds of birds. The nest of the Marsh Warbler is, however, placed much lower down than that of the Reed Warbler, and—this is important—invariably on dry, fine ground. The nest may be near water, but never *over* it.

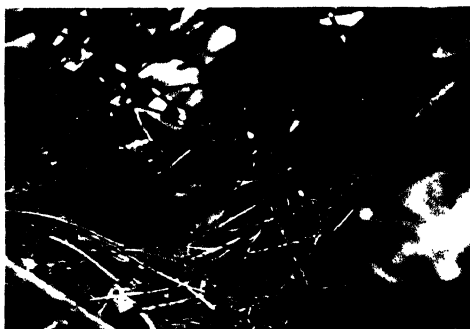
In view of the need for further details concerning the life-histories of these two birds, I commend their careful study to the notice of the young bird-lover, and wish him every success in unravelling some of the secrets still waiting to be revealed.

**Sedge Warbler.**—This bird is chiefly distinguished by its vehement and passionate disposition when singing, as well as its admirable mimicking of the notes of other birds. When fishing, I have often been highly entertained at the antics of this Warbler. The impetuous song, the torrent-like notes, uttered rapidly and in a kind of hasty chatter, cannot fail to strike the listener. Pitch a stone among the rushes or in the bush where the bird is singing, and it will sing with increased vehemence. If, too, one can manage to catch sight of the angry little sprite, its whole body will be seen to be pulsating and throbbing with anger-like defiance.

This is a solitary bird, and near water where hardly any other form of feathered life was present I have frequently found this interesting species. The favourite haunt seems to be where aquatic herbage abounds, among reeds, rushes, and the like. I have, on a few occasions, located the bird elsewhere. A somewhat late Summer migrant, the bird soon commences nest building. The site chosen is usually a low, thick bush, or among a tuft of grass. The stems of plants, coarse grass,



NEST AND EGGS OF HEDGE SPARRAW



HEDGE SPARRAW ON NEST



SEDE WARBIEK AT NEST





moss, hair, and finer grass are used. It is a neat structure. The five or six eggs are pale brown, mottled sparingly with darker brown. Occasionally I have noticed a thin dark streak or line. The food consists of insects and slugs.

Local names: Mock Bird, Reed Fauvette, Lesser Reed Sparrow, and Sedge Reedling.

The plumage is greyish-brown on the upper parts; a broad, prominent yellowish-white eye streak; pale buff under parts; throat white. Length,  $4\frac{3}{4}$  inches.

**Hedge Sparrow.**—This is a far different bird to the better known House Sparrow, and in no way related to it. This is largely an insectivorous bird, sings a delightful little song, builds a remarkably tidy nest, lays beautiful blue eggs, and the male in his quiet Spring attire is very handsome. Early in the year the male perches upon the topmost twigs of a bush or hedgerow, and sings in a plaintive strain a somewhat faint but pleasing song. The notes are not much varied, but sweet. This is an early nester, and March generally sees the homestead completed. Hedges, bushes, shrubs, trees, bank-sides, haystacks, and other places, are chosen in which to locate the nest. This is somewhat large, and consists of moss, twigs, dry grasses, and wool, neatly lined with hair. The four to six eggs are generally bright bluish-green, but I have found many specimens of a rough texture and light blue in colour. Besides insects, small seeds and scraps are eaten in Winter. A number of old-fashioned names have been conferred upon this bird, such as Dick Dunnock, Cuddy, and Shuffle Wing. In the pairing season the male has the habit of dropping his wings and then moving them in a shuffling manner. This accounts for the local name of Shuffle Wing. It is not such a large bird as the cosmopolitan species known to everyone, but is altogether more elegant-looking. The crown is ash-coloured, streaked with brown; neck, sides, throat, and breast bluish-grey; back and wings reddish-brown, streaked with a darker tint; breast and belly buff-white. Length,  $5\frac{1}{2}$  inches.

This is a very favourite species, with whom the female Cuckoo often entrusts her egg and unruly chick.

**Dipper.**—Little known in the South, the Dipper should

be sought for in some Scottish burn or among the streams of Derbyshire and other English counties, as well as in Wales and Ireland. The bird cannot fail to arrest attention when observed, and cannot be confused with any other species. It is Wren-like in habits and general structure, but an altogether larger bird. It has a white throat and belly, remaining plumage black or blackish-brown. The female is more dingy-coloured. Length,  $6\frac{1}{2}$  inches. Mr. Hudson very appropriately calls it "a big black Wren with a silvery-white bib." The same haunt is resorted to year after year, and the bird has its particular range, like the Robin of our gardens. It dives with precision and secures an abundance of food *under* water. In a clear pool it is intensely interesting to observe the bird obtaining food from the limpid depths. Aquatic insects of various kinds constitute the food, and these it catches both in and out of the water. A pretty, although short, song is uttered, and this, curious to relate, resembles some notes of the Wren. The Dipper may be heard singing cheerily on a cold Winter morning, when his haunt is frost-bound, and huge icicles hang in dense spikelets from the higher ground. How, during some severe Winters, the bird manages to secure sufficient insect food has often puzzled me. There, with hardly a soul to hear him, he sings, pouring out his lilting little strain, which is strangely sweet, among the solitudes he loves so well. The globular nest is placed in banks, caves, crevices, holes, under old bridges, in the fissures of rocks, and other situations. It is made up of moss, with feathers and dry leaves for a lining. The small hole is near the base. I have found the nest at the back of a rock just hidden under a fissure, and over which a strong current of water was continually passing.

The four to six white eggs are very pointed at one end.

We now reach the Titmice family. These are very active, engaging birds, inhabitants of woods, lanes, gardens, and towns, and exceedingly useful in ridding us of a quantity of insect life. One of them, the first on our list, constructs what is generally recognised as the most beautiful nest built by any British bird.

**Long-Tailed Tit.**—It is pleasing to notice that this wonderful little feathered acrobat is increasing its range in several parts of the country. To observe a company of these birds hunting for food is a delightful form of outdoor occupation. The round body, long tail, butterfly-like flight, soft plumage, engaging habits, and agreeable sibilous chattering, all help to attract attention. As the birds pursue their pilgrimage from bush to bush, or branch to branch, of a tree, one of the quietest and yet most fascinating sights in Birdland is presented to view. There is something so captivating about the quiet, unobtrusive habits of this species which appeals to one. The nest is placed in a furze bush or a hedgerow, and is of remarkable construction. Some are bottle-shaped, others are more globular. Sometimes the hole is towards the centre, and at others near the top. This is usually well hidden. Lichens, moss, wool, spiders' webs, leaves, and other materials, are used, and the inside consists of a great profusion of feathers. Over 2,000 have been found in one nest, each meaning a separate journey! Add to this the other materials utilised, and one is able to realise the enormous amount of patience and perseverance of these birds in constructing their really wonderful home. The eggs vary in number. From six to ten may be given as the average, but I have known nests containing as many as fifteen and seventeen. How the young Tits managed to find comfortable lodgment when there were so many of them, passes my comprehension. The eggs are white, sparingly spotted with light red, and a few marks of a purple colour. When the female sits in the nest, what do you imagine she does with her long tail? She brings it right over her back, and both head and tail may be observed just poking out of the entrance hole. The many local names given to various members of the Titmice family are too numerous to mention in detail. A few may, however, be mentioned, such as Long Tom, Bottle Tit, Poke Pudding, Tree Huck-Muck, Can Bottle, Joe Bent, Willow-Biter, Caley Tit, Bee-Biter, Tom Collier, Sit-ye-down, Billy-Biter, Blue-Bonnet, Jerrybo, Nun, Pick-Cheese, and Bumbarrel. It is unnecessary to recapitulate the food of each species of Tit. They are all

more all less insectivorous. Some may, perhaps, take fruit buds and scraps in Winter—the Blue and Great Tits dearly love a meat bone, suet, and cocoa-nut in Winter—but generally they do an immense amount of good, and should be highly encouraged.

The Long Tail has a white head, neck, throat, breast, and part of outer tail feather; black back, wings, and six centre feathers on the tail; there is a black streak over the eye, and a tinge of rose-red on the sides of back; reddish-white under parts. The bird has a long tail, a short beak, and a round little head. Length,  $5\frac{3}{4}$  inches.

**Great Tit.**—This is a very handsome bird, especially the male in the early Spring. The head, throat, and band on centre of breast are jet black; back olive-green; white cheeks and nape; yellow breast and belly. This is our largest Tit, measuring 6 inches in length. A most interesting bird at all times, this species is always one of my most constant woodland companions. He thrusts himself upon one, as it were, by his fussy ways and strange vocabulary of notes. In the Spring the love song is very characteristic. It somewhat resembles a metallic “tinkle, tinkle, tinkle” many times repeated. It is a grating, piercing note, and owing to this utterance the bird is called the Saw Sharpener. It also gives voice to many other notes, too numerous to mention and too difficult to write down. It is a mimic too. I have had the bird deceive me a number of times. It utters the “pink, pink” of the Chaffinch, and one or two of the notes of the Nuthatch in a most realistic manner. Whilst it is a typical woodland-loving species, it is also found in lanes where trees abound, and in large gardens. As a nesting site the Great Tit chooses somewhat similar places to those selected by the Blue Tit, such as a hole in a wall, post, bank, tree, box, underneath a flower-vase or flower-pot, a crevice in an old tree, a tree-stump, and so on. One I once saw, which had been placed at the base of an ornamental flower-vase on a lawn, was a remarkable structure when the vase was lifted, the shape of the nest coinciding with the vase as if the nest had come out of a mould. Whilst the Blue Tit is awfully fond of nesting in the column of a lamp-post, I have



GREAT PTMOUSE WITH FOOD



GREAT PTMOUSE WITH FOOD



not observed the Great Tit to make use of this strange nesting-place. During a recent Summer I knew of at least a dozen Blue Tits' nests in the last-mentioned site.

The nests of both species are practically identical, dry grass, moss, hair, feathers, and wool being used. The seven or eight eggs are larger than those of any other British Tit, and are white, speckled with reddish-brown. They are very similar, indeed, to those of the Nuthatch, both as to colour and size. This is a very pugnacious bird, and should not be kept in confinement among other species, quarrelling with and killing them on the least provocation.

**Coal and Marsh Tits.**—Neither of these species is so well known as the Great Tit and the Blue Tit. For one thing, the Coal and Marsh Tits are much more soberly clad, and are quieter and less fussy in their general habits. They are also less common. The Coal Tit has a black crown, throat, and front of neck; white cheeks and nape; grey upper parts; bluish-grey wings, with two bands of white; white under parts, tinged with greyish. It is  $4\frac{1}{4}$  inches in length, and a trifle smaller than the Marsh Tit. The Marsh Tit has very similar plumage, but the *absence* of black on the throat and the white cheeks and nape at once help to distinguish one bird from the other.

The Coal Tit resorts to woods much more than the Marsh Tit. The latter, as its name implies, seeks the neighbourhood of marshy ground, for whereas the former nests in the hole of a wall, tree, a dead stump, or other inviting places, the Marsh Tit mostly selects a hole in a rotten tree-stump, generally in a swampy locality. It seems to me, however, that the Marsh Tit resorts to woods a great deal more than is generally supposed, especially those of a moist description. All the Tits—excepting the rare Bearded species—love trees, and obtain their food therefrom, and it is in the neighbourhood of trees that they should be sought.

Whereas the Coal Tit uses similar materials for nesting purposes to the Great Tit already described, the Marsh Tit utilises moss, rabbit's flick, wool, and willow down.

The six to nine eggs are white in both species, speckled and



spotted with faint red-brown, mostly at the larger end. The Coal Tit utters two shrill, sharp notes, somewhat resembling its own name, and that of the Marsh Tit is not so very dissimilar, but is neither so loud nor so piercing.

**Blue Tit.**—Seen in his best attire, a male Blue Tit is a really charming little bird. He visits our garden regularly in Autumn and Winter time for the food placed for him in a cocoa-nut husk, and it is remarkable to notice the regularity with which he comes, three times a day—breakfast, dinner, and tea. It mostly happens that he is partaking of his meals at the same time as ourselves; but how the bird can so accurately make its appearance day after day, and week after week, I could never discover.

Let me tell you of his gay plumage. He has a blue crown, encircled with white; white cheeks, bordered with dark blue; olive-green back; bluish wings and tail; breast and belly yellow, marked with lines of dark blue. It is quite a small bird, attaining a length of  $4\frac{1}{2}$  inches. The nesting haunt, nesting materials, and general habits much resemble the Great Tit, and need not be detailed. The song is a delicate little trill, oft repeated, and a series of sharp alarm notes are also uttered. The trill consists of a succession of notes run one into another. They have, however, a very pleasing effect, and should not be overlooked by the careful bird student. To watch a Blue Tit engaged insect-hunting is a study in acrobatics, as the little creature turns this way and that in its ceaseless search. It can hang upside down with amazing cleverness and facility, and, taken altogether, is one of the prettiest and most engaging little birds we possess.

The seven to nine eggs are white, speckled and spotted with faint red-brown, generally at the larger end.

The young of all the Titmice family are remarkably pretty chicks—especially those of the Coal Tit—and a good deal of interesting information may be collected concerning them.

**Nuthatch.**—A typical woodland bird, or of large gardens where big trees are found. I am of opinion that this handsome bird pairs for life, as I have for many years now observed the male and female in company all the year through. Whilst the

Tits in their engaging habits in the trees are interesting, this bird, the Tree-Creeper, and the Woodpeckers are still more so. Of them all I think the Nuthatch and the Tree-Creeper are the most remarkable. To see one of the former birds running up or down a tree, or along a branch, is a study in avine locomotion. It reminds one more of a Squirrel or a Mouse than a bird until it flies off, or gives voice. Being so restless, it is difficult to get a good sight of it at close quarters, and the indispensable field-glass must be brought into operation. The observer, on seeing the bird for the first time, is probably struck with the uncommon appearance of it. Although only  $5\frac{1}{2}$  inches long, it is a plump-built species. The short tail and long strong beak are sure to arrest attention. The bluish-grey upper parts; white cheeks and throat; black streak over the eye; buff-coloured breast and belly; and chestnut-red flank and lower tail coverts, give the Nuthatch a very handsome appearance. It feeds upon insects very largely, but also takes acorns, beech-mast, berries, and nuts. These latter it collects and jams in the bark of a favourite oak-tree for the purpose of securing the kernel. The nutshell is not split asunder, as might be imagined. I have caught the bird in the act many times, and found that a hole is drilled into the shell, and the contents scooped out. The bird hangs on to the bole of the tree in a most wonderful way, and hammers away at the nut until it has achieved its object. In the Winter-time I have counted a large number of nuts—full and empty—in one particular tree, to which I have become so attached that I rarely visit the wood without making a pilgrimage thereto.

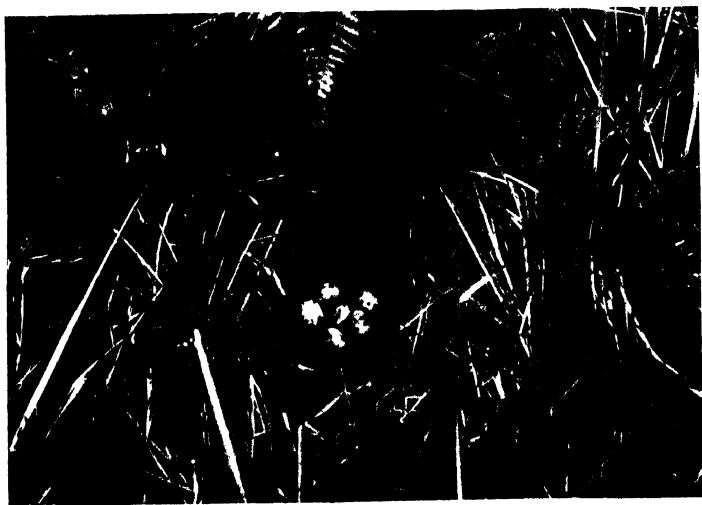
The notes of this bird are many, and although I claim to know it well, I have not, even after twenty-five years' bird work, mastered the vocabulary at the bird's command. In the Spring I have been deceived again and again at the notes this bird utters, and not until I have carefully stalked the bird—a difficult matter at times—have I discovered it was my old friend the Nuthatch at his tricks again! A clear "twit-wit-wit" is perhaps the more characteristic utterance, but there is a louder and shriller note made in Spring that it is not possible to write down. When flying, a soft and low note, such as "si,

si, si," is uttered; indeed, a careful study of the Nuthatch would, I believe, reveal a good deal of fresh information concerning it. The nest is made in the hole of a tree or wall. At first a larger hole is made than is required, but eventually it is plastered up with clay, the hole left just admitting the bird. Very little attempt is made to build a nest, dry leaves, pieces of bark, and other materials being used as a kind of bed. The six or seven eggs are white, spotted with red-brown. Occasionally the eggs are blotched rather than spotted. The bird's habits have resulted in a number of curious names, such as Jar Bird, Mud-Stopper, Mud-Dabber, Nut-Jobber, and Wood-Cracker.

**Brown Wren.**—Mostly known as the Jenny Wren, this is a favourite bird with many people. At the same time its life and habits are not very well understood, for many country people still cling to the belief that the Wren is the *female Robin*. I heard a very learned doctor state quite recently that the female Robin did not possess a red breast, and was distinguished from her mate in that way! I hope the young naturalist will not fall into such a grievous error as that. It may be stated straight away that the Wren is quite a distinct species from the Redbreast, and should never on any account be confused with it. This Wren is a really wonderful little bird in many ways. The remarkably strong, clear, passionate song is in itself quite distinct among our British birds. A riding in a wood is a good place to watch this bird in the courtship season. The male hovers and flutters in the air on tremulous wings like a butterfly, and I have many times been deceived in this way. At other times the bird creeps about hedgerow bottoms mouse-like, or flits nimbly from twig to twig. The love impulse is very strong, and the attractive flight and passionate outburst of music characterise this wee feathered mite as a wonderful little bird. He will sing at any time. The weather has no influence upon him. He does not possess, like most birds, a certain song period. He may be heard on and off throughout the whole year, but is seen and heard at his best when love-making is in full swing.

\* Mostly reddish-brown in general coloration, with a pale eye-





streak, dusky tail, barred with black, the pert, perky appearance, short upturned tail and stout body, attract the observer the most. It is the same length as the Gold Crest, but a much plumper bird. A wonderful adept at placing its nest in unlooked-for places, and of constructing it of such materials as match the surroundings, the crevices of rocks, in old posts, on a tree-stump, among bracken, in hedges, out-buildings, in an ivy-covered bower, on banks, or even among a bundle of old horseshoes—these are a few of the many situations that are chosen. The large nest is dome-shaped, with a small hole somewhere near the top, but very skilfully hidden. Moss, lichens, twigs, hay, dead leaves, and bracken, are a few of the various materials selected, the lining consisting of hair, fine moss, and feathers. Many more nests are, for some reason still unknown, built than are occupied, and the materials used vary according to the surroundings of the nesting site. As many as thirteen eggs have been found, but six to ten is the more usual number. These are white, faintly spotted with red. The food consists of wood lice, small spiders and insects; stray scraps are also eaten in Winter.

**Pied Wagtail.**—The first representative on our list of a graceful family of birds, the present species, in his black-and-white livery and engaging ways, has long been a favourite. The Summer and Winter plumage differ. In Summer it is black and white; in Winter the back and scapulars are ash-grey, the chin and throat white, and the gorget black. Length,  $7\frac{1}{2}$  inches. Although not restricted to the neighbourhood of water, Wagtails often resort to it, delighting in running in the shallow pools and along the water's edge. Here apparently an abundance of insect life is found. Ploughed and grass fields, cricket grounds, and among cattle and sheep folds, are also favourite resorts. In the vicinity of the latter this bird is fond of picking at the tops of the partly eaten turnips that have been gnawed by the sheep, and I find a tiny maggot which infests the turnip is much relished. These are the smallest birds that walk, and the captivating gait and the habit the bird has of moving its tail so gracefully commend it to all lovers of our feathered folk. The nest is built in a variety

of places. Piles of wood and faggots, an overhanging bank, holes in walls, quarries, pits, crevices of various kinds, out-houses—such are a few of the nesting sites chosen.

The compact and tidy homestead is made up of grass, moss, roots, and perhaps leaves, with a lining of feathers, hair, and wool. The clutch of eggs usually numbers five. These are greyish-white, profusely spotted with greyish-brown. The alarm note is a shrill “tis-it, tis-it, tis-it” something like that of the Swallow and the Meadow Pipit, but in the Spring a very delightful song is uttered which appears little known. I have heard it on a few occasions only, but, being inaudible a short distance away, it is doubtless often overlooked.

This species has long been known by a number of local names such as Dish-Washer, Peggy Wash-Disher, Nanny Wagtail, and Washerwoman. In some districts this bird is a Summer visitor only; in others it is to be found all the year through.

**Grey Wagtail.**—This Wagtail is more restricted in its distribution than the last-named, and seems more fond of keeping near water. It may be located in the same haunt year after year. It is about the same size as the Pied species, but has in Summer a bluish-grey head and back; a pale eye-streak; black throat, and bright yellow under parts. In Winter the throat and chin are whitish-yellow. All the Wagtails are insectivorous, and are to be regarded as eminently useful birds. The situations chosen as nesting sites are somewhat similar to those enumerated in the case of the bird last under review, but somewhere in the vicinity of water is the more usual habitat. The structure resembles that of the Pied Wagtail, but the five or six eggs are pale French-grey in colour, mottled and clouded with a faint creamy-brown.

The alarm note resembles the last-mentioned species, whilst in the pairing season a sweet and lively song is uttered.

**Yellow or Ray's Wagtail.**—This is a Summer visitor only, arriving some time in March. The male in his Spring attire is a handsome fellow. He has a greenish-olive head, lore, nape, and back; a bright yellow streak over the eye; sulphur-yellow under parts. Length, 6 inches. A few liquid

notes are occasionally uttered on the wing, but this is the poorest songster of a rather unmusical family. The nest is placed in fields, on a bank, under a tuft of herbage, or in a wall from which a stone has become detached. It resembles that of its relatives, but no wool is used. The five or six eggs are whitish, mottled nearly all over with yellow-brown and ash-brown. Local names: Cow Bird, Seed Lady, Yellow Wagster, and Summer Wagtail.

**Meadow Pipit.**—A bird of the downs, commons, heaths, and moorlands, the Meadow Pipit attracts the observer by its tinkling song, and, when disturbed, by the shrill alarm cry. The song possesses little variation, but, being mostly uttered as the bird is descending from a height of 50 feet or so, cannot fail to escape notice. The Tree Pipit is easily this bird's successful rival. In Scotland I have found the Meadow Pipit exceedingly common, and it appears to be quite the commonest foster parent of the young Cuckoo.

In various parts of the South of England it is a Winter visitor only, resorting to ploughed fields and especially sheep-folds. The food is made up of insects and their larvæ and seeds. The neat nest is placed among grass on a bank, among heather, or in a meadow. Wool, grasses, roots, and moss are used, with a lining of fine grass and a little hair. The five or six eggs are reddish-brown, closely mottled with darker brown. The young are soon covered with a fluffy black down. The parent bird has the habit of fluttering over the herbage when flushed from the nest and feigning a broken wing. It is not generally known that this bird, unlike its near relative the Skylark, perches in both tall and small trees. A number of curious names have been accorded. A few may be given—Titlark, Heather Cheeper, Heather Lintie, Moss Cheeper, Moor Titling, Teetick, Teetling, and Wekeen.

The plumage on the upper parts is ash, tinged with olive, with dark brown on the middle of each feather; dull buffy-white under parts, well spotted with dull brown; hind claw longer than toe and slightly curved. Length,  $5\frac{3}{4}$  inches.

**Tree Pipit.**—Whereas the Meadow Pipit is a resident species, the Tree Pipit is a Summer visitor only. It arrives



about mid-April, and returns year after year to the same haunt and even to the same tree. The bird has rarely failed me these many years, and I almost invariably see or hear it for the first time in the very same spot as the previous season. The chief characteristic of this happy bird is its fascinating song-flight. When not engaged nest-building, or taking food to the young, this Pipit is almost always to be seen in a tree. It does sing upon the ground, but perched in a tree-top or mounting in the air appears to be its more favourite occupation. It dearly loves oak-trees, and on the highest or outside branches of these it sits and sings. It is also fond of telegraph wires. If the observer, on hearing the song, will wait a few seconds, he will be rewarded by a sight of the bird as it leaves its watch tower. It mounts several feet in the air on tremulous wings, and then commences the descent. The wings during the latter movement are practically motionless, and it is a study to observe the ease and buoyancy with which the bird travels. When the ascent is commenced the song does not strike one as of a very brilliant description, but as the bird proceeds on its aerial course it increases in volume, until, just as the downward flight is commenced, a series of rich, piercing notes are uttered, which cannot fail to attract notice. Then, just before alighting, either in the tree from which the flight was begun, in a neighbouring tree, or upon the ground, a few hurried notes are uttered as a sort of cadenza. This is a very favourite bird of mine, and I never tire of watching and listening to it. Few people seem to know it, and those who do call it a Titlark. To appreciate the songs and notes of birds the ear must be thoroughly well trained. Practical acquaintance with our feathered population must be sought to obtain any real knowledge of them. Whilst books will undoubtedly prove of service—especially by way of confirmation—the young bird student should be in the country lane, the wood, the field, the marsh, or by the river-side, armed with a field-glass, whenever opportunity offers. That is the real road to successful bird work. I am led to write thus because I was reminded that this last Spring (1908) I heard the Tree Pipit singing for the first time in the teeth of a bitter storm. I do not suppose one

person in a hundred passing that way would have noticed the herald of Spring, but a practical acquaintance with the bird, and a keen desire to record the movements of birds year after year, brought its reward.

The nest is usually built on a grassy bank or in a cornfield. It is often placed near a bush or tuft of grass. It is composed of roots, wool, grasses and moss, with a neat lining of finer grasses and a little hair. The four to six eggs vary in colour. One handsome variety is purplish-red or chocolate in ground colour, clouded and spotted profusely with various shades of greyish-brown or streaked and blotched with darker tints; another variety is yellowish-white in ground colour. The food is similar to that of the Meadow Pipit already described. This is a slightly larger bird than the last-named, being 6 inches in length. It is ash-colour on the upper parts, tinged with olive, with dark brown on the middle of each feather; across the wing there is a double band of yellowish-white; the two outer tail feathers are white; throat and region of eye dull white; breast buff, with longitudinal dark spots; dull white underneath.

**Rock Pipit.**—Far different in its haunts, this Pipit resorts to various parts of our coast-line, and should there be sought. It is a trifle larger than the Tree Pipit, being  $6\frac{1}{4}$  inches in length. It is greenish-brown above, with darker brown on the centre of each feather; whitish streak over eye; dull white under parts, spotted and streaked with dark brown; hind claw much curved and same length as the toe. It has the song-flight of its two relatives, and utters a sweet, short song, which, in view of the rugged character of the bird's haunts, is distinctly pleasant to hear. It is a trustful bird, and one is able to get quite close to it without difficulty. The nest is built under stones, in a rabbit's burrow, in holes, or ledges of sea-cliffs. Seaweed, coarse grass, and sometimes moss, are used, with a lining of finer grass and occasionally horsehair. The eggs number four or five; these are greenish, mottled with dusky-brown, or dark cinereous markings.

In the Summer the food is made up of marine insects, worms, and small crustaceans; in the Autumn and Winter small seeds are eaten.

This, like the Meadow Pipit, is a resident species; it is a very active, engaging bird, and a welcome addition to the small forms of bird life to be observed by the sea and seashore.

**Red-Backed Shrike.**—A late Summer migrant, the Red-Backed Shrike, with its hooked beak, reminds one of a small bird of prey. Indeed, old naturalists classed it among them. He always strikes me as a very silent and solitary species. I rarely observe him unless he is sitting quietly upon a telegraph wire or some favourite thorn-bush. The chief distinguishing feature is the manner in which the food is attached to thorns not far from the nest. It is owing to its habit of killing that it is called the Butcher Bird. Small mammals and birds, frogs, lizards, and large insects, constitute the food, and these are impaled upon thorns somewhere in the vicinity of the nest. Whilst this Shrike is a voracious eater, it seems that more food is secured and placed in the "larder" than is required. Similar to the Owls, the indigestible portions are cast up in the form of "pellets." Whilst I have found this bird's larder several times, and observed it a good deal, I do not remember seeing it capturing its prey excepting on rare occasions. I believe it feeds upon grasshoppers, as I have watched it catching large insects on a railway bank, an examination of which revealed a number of these cheery little tenants of the countryside.

Hedgerows, bramble and other bushes, are the usual haunts of this bird. The nest is sometimes placed high up and out of reach; at other times I have found it only a couple of feet from the ground. It is composed of the stalks of grass, moss and roots, lined with down or wool. The four to seven eggs are bluish or greyish-white, spotted at the large end with light brown or ash. There is another type of egg that is pinkish-white in ground colour, spotted with light brown and grey.

In a wild state this species does not aspire as a musician. A harsh scolding note is uttered when one is in the vicinity of the nest, but, generally speaking, the bird is very mute. Nevertheless, when kept in confinement, it is said to acquire considerable ability as a songster, and to learn tunes and airs with much exactness and cleverness. The male is grey on the

crown and nape; mantle chestnut-brown; rose-buff on under parts; tail feathers black, with white bases; a prominent frontal band of black, as well as on toes and ear-coverts. Length, 7 inches.

The female is more softly garbed, and beautifully barred with brown across the breast. She is reddish-brown above instead of chestnut, and does not possess the characteristic black ~~larks~~, eyebrows and ear-coverts. These in her case are buffy-white. The young somewhat resemble the female, but are more chestnut-coloured, and have blackish-brown ear-coverts. The young naturalist would do well to carefully observe the plumage of the male, female, and young of this interesting bird, and note the many other distinguishing features which considerations of space preclude us from mentioning.

**Spotted Flycatcher.**—Another late Summer migrant, and, curiously enough, a silent species for the most part. The bird is often unseen until it does happen to attract notice by uttering its curious note, likened to “utik, utik, utik-tik,” or of taking a little journey in the air and returning to its starting-place. It is a complaining utterance, and cannot fail to arrest attention. This is a most useful insect-eating bird, and the number of insects a pair must get rid of during their sojourn among us is almost incalculable. Reference has been made in detail to this on page 140 in this chapter, and our notes there also set out some of the general habits, which need not be repeated. The Spotted Flycatcher dearly loves an old orchard or garden, the neighbourhood of a park, or the outskirts of a wood, in which to pass its Summer residence. An insignificant-looking bird in its ash-brown and whitish garb, with a spotted breast, this is one of those feathered creatures that must really be looked for if success is to be obtained. It is at all times an active, engaging species. Solitary in its habits, it somewhat reminds one in this respect of the Shrike, last under review. The nest is placed in various positions. Between the branch of a fruit-tree trained against a wall; in a porch; among ivy upon a tree; in an out-building; the hole of a wall—such are a few of the chief nesting sites. The nest is made up of moss, fine grasses, and a little hair. The four or five eggs are greyish-

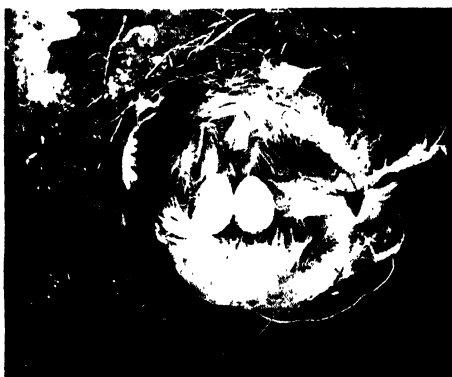
white, blotched with pale orange-brown. The egg appears to vary in size, and one particular type is a very handsome one.

A number of local names have been accorded, such as Beam Bird, Bee Bird, Cherry-Chopper, Cherry-Sucker, White Baker, Fig-Eater, Wall Bird, and Cherry Snipe. Several of these are ill-deserved by this perfectly harmless species. The food consists exclusively of soft insects, and I have never known any pilfering among fruit in any shape or form. One of the pleasantest Birdland sights is to observe the young brood out of the nest, perched upon a fence or rail, and attended by the parent birds. Each young one in time becomes an expert insect-catcher, and the attention devoted by the old birds to their fledgelings is most interesting to notice.

**Swallow.**—This bird and the House and Sand Martins all belong to the same family—the *Hirundinidae*—and must not be confused with the Swift, which, although possessing somewhat similar habits, is in no way related to them. This needs emphasising, in view of the mistaken impression that still prevails respecting this latter bird. All four species, however, are Summer migrants to our country. First comes the little Sand Martin, then the Swallow and House Martin, and last of all the Swift. The Swallow is known by sight to almost everyone. Its remarkable swift flight and graceful aerial evolutions cannot fail to attract attention as the bird swoops, turns and twists, rises and falls, in a most wonderful way. It possesses extraordinary powers of endurance upon the wing, and a control over its flight which is nothing short of marvellous to witness. Feeding exclusively upon insects, as all the four birds above mentioned do, they are to be regarded as unspeakable blessings to mankind. They come to us when the insect hordes are commencing to populate the air in dense numbers, and were it not for the useful work performed by these feathered benefactors England would be a far less desirable country in which to live. The Swallow places its nest in chimneys, out-buildings, under bridges, in pits, quarries, shafts, and other places. It is not exposed, like the nest of the House Martin, under the eaves, but I knew of one instance of a nest built on a branch of a chestnut-tree, a very extraordinary site indeed. The structure



SPOTTED FLYCATCHER AT NEST



NEST AND EGGS OF SWALLOW



YOUNG SWALLOWS



HOUSE MARTIN AND NEST



REEF CREEPER ENTERING NEST

is made up of mud, hay, and straw, with a profuse lining of feathers.

The four to six eggs are white, spotted, and blotched with light or dark brown. It is a somewhat long egg, larger than that of the House Martin, and not nearly so rounded. The alarm note is a sharp "tisit, tisit, tisit," and a most pleasant twitter is uttered both upon the wing and when the bird is sitting in a tree, which—contrary to general knowledge—it is very fond of doing. On seeing a Swallow near at hand, the observer is usually surprised to find that it has a distinct chestnut-brown forehead and throat. It is black on the upper parts, with violet reflections; dull reddish-white below; long, forked tail. The female does not possess so much red on the forehead and has less black on the breast; her under parts are white. Length,  $7\frac{1}{2}$  inches.

**House Martin.**—This favourite little bird may always be distinguished upon the wing from the Swallow by having a prominent white rump, a catapult-forked and shorter tail, and the Martin turns and twists much less and has a slower flight. It is a pretty little species closely examined, and when engaged collecting mud by the water's side, or in a road after a shower of rain, presents a very engaging sight. It is blue-black above and pure white below. The legs are feathered right down to the toes. Length,  $5\frac{1}{2}$  inches. The eave of a house is a very favourite nesting site, and the bird returns year after year if unmolested. An old house in a Hertfordshire village of my acquaintance has contained as many as fifty nests in one season! The structure is very wonderful, being built in a most ingenious manner in the form of a cup without a handle. Clay, mud, hair, and fibres are used, the two last-named to strengthen the mixture, and a lining of straw, hay, and feathers. The four or five eggs are white and usually unspotted. Some varieties, however, are faintly spotted with red. This bird—unlike many others—warbles sweetly when actually in the nest. It is a very sweet little utterance, and appeals strongly to those who appreciate Birdland sounds.

**Sand Martin.**—Wherever there is a sand-pit and water close by, there, early in April, one may watch for this, the



smallest member of the British *Hirundinidæ*, with almost certain success. The mouse colour of the upper parts and smaller size at once distinguish the Sand Martin from either of its relatives already described. The legs and feet are not feathered, as in the case of the House Martin, and the short tail is forked. The under parts are white. The flight is swifter than that of the other Martin, and large numbers of these birds often congregate together. I have known over 300 birds tenanted one sand-pit, and the sight of many of the birds in flight was a very striking one. The industrious little bird tunnels out a hole a yard or more in length, and at the end of the chamber deposits straw, grass, and feathers. The four to six eggs are white and very pointed. When flying undisturbed a low note is uttered, but this is prolonged into a kind of scream when the birds are disturbed. The male also utters a pleasing twitter.

**Tree-Creeper.**—Still another bird that has to be numbered among those species usually very silent. My friend Dr. Ernst Hartert tells me, however, that the male bird does sing, in spite of statements to the contrary. The manner in which this little Creeper hunts assiduously for food is very wonderful to witness. As the wee mite proceeds to craftily thread its way, as it were, round a tree, it reminds one of a mouse rather than a bird. Watching it closely, it will be seen that the sharp pointed tail feathers ably help to support the body during its progression either up, round, along, or down a tree, and the sharp hooked beak admirably assists it in its industrious search for insects and their larvæ. This constitutes the food.

The nest is usually placed in a hole or crevice of a tree. Where a branch has been snapped off and left some jagged portion is a favourite site. Behind a piece of loosened bark is another equally favourite position. The nest is composed of grass, dead wood, bark, and twigs, with a lining of moss, feathers, and hair. The six to nine roundish eggs are white, spotted with reddish, mostly in the form of a zone at the larger end.

The call-note is shrill and high-pitched, and the song consists of somewhat similar notes uttered a few at a time. The

general plumage is yellowish-brown, dark brown, and buff-white, with a pale streak above the eye. Length, 5 inches.

**Goldfinch.**—This, the first representative upon our list of the Finches, or *Fringillidæ* Family, is perhaps the most handsome of them all. Thanks very largely to the efforts of our County Councils in protecting the Goldfinch all the year through, it is pleasing to observe that it is decidedly increasing in various parts of the country. A few years ago bird-lovers noticed with alarm the continual decrease in its numbers, but the state of affairs became arrested before it was too late, and now there is no cause for alarm whatever. Where in my country walks a few years ago I hardly ever saw a Goldfinch, it is rare now that I ever venture out without seeing or hearing several of them. Although not gaudily attired, this Finch, in his scarlet and yellow, is a picture indeed. Imagine him upon a blue cornflower in the fields among the green oats, and you have as beautiful a bird picture as it is possible to see. He is blood-red on the front of head and throat; white on cheeks, fore-neck, and under parts; dark brown back; beautifully variegated wings of white, black, and yellow; tail black, with white tips. Length, 5 inches.

Orchards, large gardens, evergreens, and bushes may be mentioned as the nesting haunts of this bird. The structure itself is somewhat akin to that of the Chaffinch, but it is not so deep as the nest of the latter bird. Moss, lichen, hair, feathers, and roots are used, with, on occasions, the silvery seed-down of the willow. The four or five eggs are bluish-white or pale grey, spotted with greyish-purple and red-brown. Sometimes they are streaked.

The Finches are distinguished from the Warblers by being hard- instead of soft-billed birds, seed-eaters instead of insectivorous. The Goldfinch has been aptly named the Thistle Finch. That the bird has a great partiality for the seeds of these wild plants all those who live near where thistles flourish will be aware. Various other seeds are, however, eaten, and the bird performs much good in helping to eradicate some of the farmer's worst plant enemies.

The call is composed of half a dozen shrill notes of a lively

and attractive description, whilst the song, even if somewhat mediocre in parts, contains a number of rich Skylark-like notes delightful to hear. Some notes of the voracious Greenfinch may, on occasions, be mistaken for those of the Goldfinch ; but the young ornithologist, having once acquainted himself with the distinguishing features, is not likely to go astray. The young are called Grey Pates, and it is difficult to distinguish between the male and female without handling them. This species is much sought after as a cage-bird, not only on its own account, but because of the readiness with which it pairs with a Canary, and the fine singing "mules" which result therefrom.

**Greenfinch.**—One of the few birds that sing upon the wing ; a veritable glutton ; a handsome bird in his green-and-yellow livery, but a somewhat cumbersome and ugly-looking species—such, shortly stated, are some of the chief features of the Greenfinch. This is a very common Finch, and cannot well be overlooked by the veriest tyro in ornithology. It dearly loves high hawthorn hedges as a nesting site, or a thick bush. I have long since thought that in a way this bird is a sort of coloniser, for I have observed with interest on many occasions that a number of these birds nest comparatively close together. This is an original statement, and may perhaps meet with some dissent. Such, however, is the result of several years' careful bird work, and one that prominently asserts itself year after year. I do not for one moment mean to state that isolated nests of the Greenfinch are not to be found, nor that those found in little companies are *quite* close together. I have, however, found at least a dozen nests in the same hedgerow within, say, 50 yards, whereas I had wandered miles previously without locating a single nest. The nest is larger and not nearly so neat as that of the Chaffinch and Goldfinch. It is built of moss, twigs, grass, and roots, and often lined with red cow-hair—at least, those in my own district are. The four to six eggs vary a good deal, not so much in colour as in size. Bluish-white, spotted or streaked with reddish or purple, with markings of a darker shade, will answer the general description. The dietary is varied. Seeds of various kinds

(especially those of the Sunflower, which are of an oily nature, and beloved by this bird), buds of trees, and similar things, are eaten. The Greenfinch has a most voracious appetite, and has earned the unenviable reputation of being a feathered glutton. The characteristic note of this bird is a rusty sort of sound, something like a bough being blown to and fro by the wind. It is quite a creaking note. Another vocal effort may be likened to two or three notes of the Goldfinch, whilst the song upon the wing, even if not at all unpleasant, cannot be said to be particularly rapturous or inspiring.

In many country districts this bird is known as the Green Linnet, whilst others, on more intimate terms of acquaintance, have christened it Joey. The yellowish-green plumage is variegated with yellow and ash-grey. Length, 6 inches.

**Hawfinch.**—In some parts of the country this species is fairly abundant, but in others it still seems very local in its distribution. Somewhat similar to the Greenfinch in build, but 1 inch longer, the powerful short bill, black throat, reddish-brown cheeks and crown, ash-grey nape, dark reddish-brown back, black wings, white on great coverts, light purplish-red under parts, at once distinguish one bird from another. The nest is placed in the arm of a tree, in a bush, among a matted hedgerow, and elsewhere. Sometimes it is a good height from the ground, at others within a few feet of it. It is composed very largely of small twigs, with plant stems and lichen. The lining consists of hair and roots, but the first-named may be missing. The three to five eggs are much larger than those of the Greenfinch. They are greenish-grey in ground colour, spotted with brown, and streaked with bluish-black. The food is made up of berries and insects. In gardens much harm is perpetrated in early Summer among unprotected peas. The note is low and plaintive. The bird is often called the Grosbeak.

**House Sparrow.**—Of the good and bad deeds of this much-abused bird it is not for us to speak. That both beneficial and dire results are due to the bird's presence in this and other countries is unquestioned, but it is a moot point whether the balance is on the wrong or the right side. Personally, I

think that, taken all through the year, the cosmopolitan Sparrow does more good than harm. It eats weed seeds, insects, scraps, refuse, corn, and a host of other things too numerous to mention. I have seen it catch a white butterfly by hawking in the air, and observed it absolutely clearing various kinds of plants badly infested with green fly. Although called House Sparrow, the nest is also placed in tall hedges and trees. Farm buildings are very favourite sites, as well as stove-pipes, and any convenient hole in a building. The structure is very large, and is made up of hay, straw, wool, roots, and often paper, string, and other curious materials. The inside is well lined with feathers. The five or six eggs vary in size, colour, and shape in a really remarkable manner. A general description may thus be given: Dirty-white, bluish, or greenish in ground colour, spotted, streaked, blotched, speckled, and dashed, or one or the other, with dark brown, greyish-brown, or some similar shade. One curious variety is white with a thick black zone at the larger end.

The vocal powers are, as is well known, not of a high order, but I once heard a wild Sparrow singing at the London Zoo in a really excellent manner, and I have heard one since almost as good.

When not begrimed with soot and smuts, the cock Sparrow is quite a nice bird. He is ash-grey on crown, nape, and lower part of back; chestnut-brown back, streaked with black; brown wings barred with white; black throat and breast (absent in female); white cheeks and sides of neck; dull white belly. Length, 6 inches.

**Tree Sparrow.**—This Sparrow may be distinguished from its better known relative by being about  $\frac{1}{2}$  inch less in length, and having chestnut-brown on the crown and at back of head, instead of ash-grey. The throat is black; there is a white collar almost round the neck; plumage above as in *Passer domesticus*.

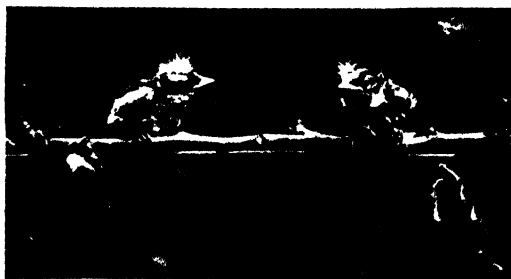
In the holes of trees that have been pollarded or gone to decay, the crevices of rocks and quarries—such are the situations in which the nest of this bird should be sought. Various materials, such as straw, hay, wool, hair, and feathers, are used.



CHAFFINCH ON NEST



NEST OF CHAFFINCH



YOUNG CHAFFINCHES



The four or five eggs are usually whitish or light grey in ground colour, spotted and dashed with dark greyish or umber-brown. The food is made up of weed and grass seeds, insects, etc. The note is somewhat similar to the last-named, but is of a shriller description. This bird, it is admitted by Sparrow-haters, does not commit the depredations of his pugnacious relative; but few people seem to be able to discriminate between the two birds, a point often lost sight of by those who are ever ready to look upon the worst side of an animal's character.

**Chaffinch.**—This is an active, sprightly Finch; a gay-plumaged bird, a good singer, and a splendid architect, four characteristic traits that should not be overlooked. Although, perhaps, the Long-Tailed Tit is its successful rival, the mossy cradle of the Chaffinch is a model of careful and painstaking work on the part of two birds. It is built of moss, lichen, hair, feathers, and roots, beautifully and compactly moulded and shaped. Some examples are better than others, but a nest of this bird is always worth looking at. It is placed in a variety of positions—in the fork or upon the side of a tree, a hedgerow, or bush. The four or five eggs—sometimes six—are ash-grey in ground colour, sprinkled with wine-red and a bluish tinge, and spotted with dark brown and black. Sometimes the ground colour is a pure pale blue, and bears a few spots only. The food in Summer is made up of insects and their larvæ; in Winter seeds and beech-mast are largely eaten. At the latter season the birds go about in flocks, the males and females separating, and keeping in distinct companies. The song is very shrill and characteristic of the singer.

In the Spring, when courtship rivalry is at its height, the cock birds sing vociferously, and it is interesting to hear each individual endeavouring to outwit his rival, and surpass his own previous effort. The notes commence in a high-pitched key, and end abruptly with a shrill cadenza. The female has a plaintive weeping note, and both sexes utter a piercing "pink, pink, pink." The white tail feathers, yellow on the wings, handsome pinkish-red breast, and chestnut back tinged with greenish, identify the male. The female is duller in colour than her handsome mate. Length, 6 inches.



**Linnet.**—A male Linnet in his finest Spring livery is a very handsome bird indeed. One must not judge this bird's plumage from a captive specimen. It is the pure wild bird of the heath or furze-clad common that should be seen in his own fastness. The general plumage is brownish, but the crimson forehead, centre crown and breast, and white edges on the black wing feathers, combine to give the Linnet a handsome appearance. In Winter the crimson becomes greyish, and at all seasons the female is duller, and lacks the first-mentioned colour. Length,  $5\frac{3}{4}$  inches. A furze, blackthorn, or hawthorn bush is a favourite nesting site. The neat nest is composed of grass, and lined with hair. The five eggs are bluish-white, spotted with light reddish-brown and purplish-red. Some are unspotted. Seeds of various kinds are eaten, and young buds in Winter. A good singing Linnet is worth walking miles to hear. The song is sweet, varied, and brilliant, and possesses a flute-like character. Notes are uttered upon the wing that somewhat resemble those of the Greenfinch. Country people call this bird the Brown Linnet to distinguish it from the Green Linnet (Greenfinch).

**Bullfinch.**—Another handsome Finch, reminding one in its general build of a Parrakeet from some far-off land. The male is a lovely bird. He has a black head, pinkish-red throat and breast, bluish-grey back, white rump, and white feathers in wings and tail. The female has a warmish brown breast, in place of the striking pinkish-red of the male, and is brownish-grey above. Length,  $6\frac{1}{4}$  inches.

A recluse bird—although visiting gardens in large numbers after the fruit buds in Winter and early Spring—this is a really beautiful species to observe along some sunlit hedgerow. When flying the white rump is conspicuously displayed. Bramble bushes, hawthorn hedges, and shrubs are the chief nesting sites. Here the frail nest of fibrous roots, a few twigs, and a sparing lining of hair, is secreted. It is a shallow structure, and when sitting the bird appears far too large for it. The five eggs are greenish-blue, spotted, or perhaps blotched, with dark brown or black, mostly at the larger end. Insects and their larvæ in Summer, and during other times

weed seeds, hips, haws, berries, and buds, are eaten. The call note is weak and plaintive, but a faint warble may be heard when the bird is near at hand. In captivity, the Bullfinch may be taught to pipe most beautifully, and commands a heavy price. It does not go about in flocks during Winter like its relatives, the Chaffinch, Sparrow, Linnet, Greenfinch, and others, but pairs for life.

**Corn Bunting.**—This, our largest member of the Bunting family, is an inconspicuous-looking bird. The plumage above is yellowish-brown, spotted with dusky colour; yellowish-white below, streaked and spotted with dusky. Length,  $7\frac{1}{2}$  inches. It is fond of heaths, commons, and downs, and very partial to telegraph wires as a perching resort. The nest is placed either upon the ground among tangled herbage or in a low hedge. Straw and dried grasses are used for the outside, with finer grass, roots, and sometimes hair, as a lining. The eggs usually number four, and are dull white, streaked and blotched with liver colour, inclining to black. The curious markings on the eggs of the Buntings have resulted in a number of old-fashioned names being accorded, such as Scribbling Lark and Writing Lark. The food of all the Buntings consists of insects, grain, and seeds. In the Winter they move about in small flocks. The Corn, or Common, Bunting, as it is sometimes called, utters a rusty little song with immense seriousness. It does not aspire as a song-bird, and is even less musical than the Yellow Bunting.

**Yellow Bunting.**—This beautiful bird is far commoner than the Corn, or Common, Bunting, last described. It is known by a number of local names, chief among which are those of Yellow Ammer, Yellow Yeorling, Gooler, Gool Finch, Skite, Golden Gladdy, and Yellow Yeldring. A typical hedge-row-loving bird, the male has the habit of sitting upon the topmost twigs, and displaying his handsome attire. This is golden-yellow on the head, neck, and under parts, with a little dark olive; yellow on breast, spotted with red; back dark. The female is not so gaudily plumed, and is spotted with dull reddish-brown. Length,  $6\frac{1}{2}$  inches. The large nest is placed in a bank, low down in a hedge, or upon the ground among

grasses. Coarse grass, moss, finer grasses, and a lining of roots and hair, complete the structure. The three eggs (sometimes more) are dirty white tinged with ashy colour, spotted and streaked with dark purplish-brown. The lines are irregular and run one into another.

The song has been compared most aptly to the words "A little bit of bread and no cheese," the "cheese" being long drawn out. It is interesting to notice that a somewhat rare bird, the Cirl Bunting, utters a somewhat similar song, but stops short at the word "bread," evidently preferring it to be understood that no bread is required, and not emphasising its likes and dislikes, as in the case of the Yellow Bunting.

**Reed Bunting.**—Resorting as it does to marshy surroundings, and possessing a black head and throat, and other distinguishing features, this Bunting may at once be known from its congeners. Osier and reed beds and similar places are favourite resorts of this striking species. The nest is built either in the small trees or woody plants growing in swampy districts or among tangled herbage. Moss, dry grasses, reed-stems, or leaves, are used, and the lining consists of fine grass, reed flowers, and hair. The four or five eggs are quite distinct from those of the other members whose life-histories we are considering. They are ashy-grey in ground colour, prominently streaked with jet black.

This is a lively bird for a Bunting, and utters a little varied song consisting of a few notes. It is often wrongly referred to as the Black-Headed Bunting. The latter is a very rare visitor to this country. A very favourite and much better name is that of Reed Sparrow.

The head and throat are black, breast and collar white. This is the plumage of the male, the female having a reddish-brown head, a less conspicuous white neck, with the under parts reddish-white, spotted with dusky. Length, 6 inches.

**Starling.**—As we approach towards the end of the Passerine birds, we reach several vastly interesting species, including, as they do, representatives of the *Sturnidae* (Starlings) and *Corvidæ* (Crows) families. So perfect in structure are these birds that many naturalists place them first in the Order

*Passeres*, before the Thrushes, which excel them only in song. The Starling is a most interesting, useful, and beautiful bird. It has engaging habits, lives to a great extent upon obnoxious grubs, and possesses, when in its best nuptial attire, splendid plumage. Known by sight to most people as he sits chattering upon some chimney or housetop, and generally regarded as a blackish-looking bird, close examination reveals a really remarkable attire. The male, female, and young are thus clothed: Male—black with purple and green reflections; pale tips of buff on upper feathers; beak yellow; feet flesh-coloured, with a tinge of brownish. Female—spotted on the under parts as well as above. Young—ash-brown and unspotted. Length,  $8\frac{1}{2}$  inches. This is an early nester, and I have known young in the nest in March. The untidy nest is made up of straw, grass, sticks, feathers, wool, moss, and other handy materials, such as paper, rag, string, etc. It is usually placed in the hole of a tree (often in a hole hewn out by a Woodpecker, the Starling building its nest on top of that of the former bird, and entirely disregarding the Woodpecker's eggs), among ivy, under the eaves of houses and outbuildings, stacks, holes in sand-pits, and other similar places.

The four to six eggs are pale blue, a trifle pointed at one end. Although in certain seasons these birds are troublesome to the fruit-grower, judged all round this is an eminently useful species, destroying grubs in grass and other fields with much diligence. It readily joins company with Rooks and Jackdaws, and when stress of weather drives it to seek shelter and food in our gardens, it is most interesting to study the habits of the bird at closer quarters than is possible in its own wild haunts. It will be observed that the Starling and some of the other members of the *Corvidæ* walk, and do not hop, as birds in general do.

The utterances are very strange. The bird tries to sing, but, with the exception of a long-drawn-out whistle, the usual result is a curious chatter. When a number are sunning themselves in a tree-top (and this is a very favourite habit), the effect is distinctly weird. In captivity the Starling becomes quite a mimic, and will imitate many calls and cries with considerable cleverness. When thus kept, I have found it exceedingly fond of

**House Flies.** It is a pretty sight to see these birds attending cattle for the purpose of obtaining insect food which there abounds. I have seen them many times perched on a Sheep's back vigorously pecking at the parasites that infest the Sheep, the latter not in the least perturbed at the birds' presence. This is a gregarious species, small and large companies being observable practically all through the year. In the Autumn and Winter the flocks in various parts of the country may be numbered in thousands, and as they have their own particular wood or trees in which to roost nightly, the movements of each battalion that comes in from the feeding grounds are most interesting to watch.

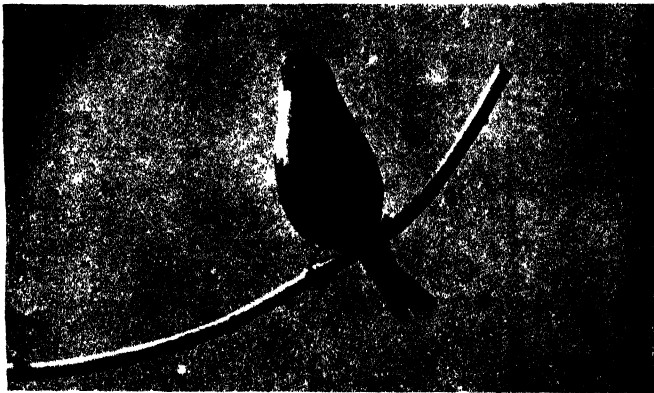
**Jay.**—This, one of the sentinels of the woods, is an artful, shy creature, and a pilferer of birds'-nests. It is a beautiful bird, but, unless examined through a good field-glass, is likely to escape close attention. It is only on rare occasions that it is observed in open country, and when seen in its own wooded domain, it is a restless, timid bird, and much patience must be exercised before it can be observed in any detail. It is quite a common species, but, being very largely restricted to preserved woods, is not often seen by the ordinary rambler in the country, and is, as a consequence, considered rarer than it really is. Two or three hundred are killed every season on a small estate of my acquaintance, and yet their number does not seem to materially decrease.

Nesting operations commence in April, and a tree-fork in some dense wood, or among a fir-tree's secluded branches, are the favourite sites. The structure is made up of large and small roots, sticks, grass, etc. The five or six eggs are faint dusky green, thickly freckled over the whole surface with light brown. The diet is a differential one, and consists of the eggs and young of wild birds (those of the Song Thrush and Blackbird are special favourites), worms, snails, insects, and fruit. Keepers have a distinct hatred of the Jay, because of its liking for the eggs and young of game-birds, such as Partridges and Pheasants.

On hearing the harsh scream of this species, a sort of "kak, kak, kak," the listener would hardly credit the statement that



YOUNG YELLOW-BUNTING



YELLOW-BUNTING



COMMON JAY



STARLING AND YOUNG

this bird may be taught to speak with remarkable cleverness. It makes a charming pet if reared from the nest, and, when it has become attached to its owner, its artful, cheeky, and impudent ways stamp it as a worthy member of an intelligent family.

The plumage is reddish-grey, and a darker colour on the upper parts; black, white, and bright blue bars on the greater coverts and the winglet; white tail coverts both above and below; greyish-white crest, streaked with black. Length,  $13\frac{1}{2}$  inches. The sexes are alike, whilst the young are duller than the parents and more fluffy. It should be mentioned that the beautiful feathers of the greater coverts and winglet are used as Salmon-flies to lure the king of fishes, and that, when flying, the white patch on the rump is a sure means of identification. Whilst the flight of the Starling is strong, bold, and well sustained, and the bird often reminds one of a small Hawk, that of the Jay is weak and jerky. The young bird-lover would do well to pay attention to the flight of birds, and endeavour to identify them when upon the wing in this way.

**Magpie.**—In some parts of our country this is quite a common bird; in others, apparently equally suitable, it is entirely absent. This is a handsome species, and, like the Jay, a docile and engaging pet and splendid mimic. It has a liking for bright articles, and has the habit in captivity of purloining and hiding any attractive object that comes within reach. The bird cannot possibly be mistaken for any other British species in his black-and-white plumage. He is black on the head, throat, neck, and upper parts, and white below; the long black tail is beautifully reflected with lustrous green, copper, and blue. Length, 18 inches. The sexes are similar; the young are more dingily coloured.

This is an early nester, operations being commenced in March. A tree or a tall hedge are the usual sites, but it is stated that low bushes are sometimes chosen. The well protected nest is composed of thorny sticks, withered shrubs, dry grasses, clay, and fibrous roots. It is often used season after season, after being repaired. A circular hole is made on one side for the ingress and egress of the parent birds. The eggs



generally number seven, and are pale bluish-green, thickly clouded, and spotted with olive-brown and underlying markings of ash-colour.

The food, like that of the Jay, is varied, consisting of Moles, Mice, Rats, Worms, Snails, grubs, fruit, insects, young birds, and eggs. A harsh kind of "chatter" describes the wild note of this bird; hence the local name of Chatterpie.

The habits are most interesting, the long tail, beautifully rounded body, and springy movements giving the Magpie a characteristic appearance, both when upon the ground and also when engaged in flight. It is worth spending some time watching a company feeding upon the ground, or, if you are fortunate enough to catch the bird examining another bird's-nest, as I have done, you will be unconsciously let into one of the Magpie's homeland episodes. I have met with this species in much more open country than the Jay, and have found its nest in a solitary birch-tree on a hill-side, from which a commanding view of the surrounding district could be obtained.

**Jackdaw.**—Another amusing and intelligent bird, and one that is increasing in our country. The shrill note of "jak" may be heard when the bird is either flying or engaged feeding with a company of Rooks. For these latter the Daw appears to possess a distinct liking, and I rarely see a flock of Rooks that are unaccompanied by them. The smaller size, shorter cut wings, and, if examined through a glass, grey patch on back of head and nape, at once distinguish the Jackdaw. The plumage generally is black, with violet reflections on crown and upper parts; dull black below. Length, 14 inches.

The nesting haunts are holes in trees, church towers, cliffs, quarries, ruins, and similar places. The nest is built of straw, feathers, dry grass, sticks, leaves, wool, shavings, and other materials. The three to six eggs are pale bluish-white in ground colour, well spotted with ash and light and dark brown.

The food is somewhat similar to that of the Magpie already set out, but upon the seashore garbage of various kinds is partaken of. When kept as a pet, the Jackdaw becomes much attached to its owner, and very amusing. It learns to speak really well when properly treated, and, if permitted to have the

run of the house and the garden, soon endears itself to the members of the household, and will not wander far away.

**Carrion Crow.**—Beyond being a much more solitary bird, the Carrion Crow may be distinguished from its near relative the Rook by the following means: the flight is heavier; the Crow utters three deep-sounding “caws” only at a time; the Rook has a bald patch of greyish skin at the base of the beak, whereas the present bird is feathered right down; the Crow only moves about in very small companies of a few individuals, and exceeds by about 1 inch its better-known relative. The Rook is of great service to the agriculturist in ridding the land of grubs—especially the destructive wireworm—whilst the Crow is more of a pilferer and thief, taking eggs and young birds wholesale. It also feeds upon offal, worms, seeds, berries, and fruit. It should be stated that it is in the Summer that this bird possesses more solitary habits, for in the Winter it may be seen associating with a few Rooks or Jackdaws. The large nest is used, like that of the Rook, year after year, the structure undergoing repair each Spring. It is usually placed in some tall tree in a secluded wood or plantation, as well as on rocky cliffs. Sticks, weeds, mud, clay, leaves, grass, wool, hair, and feathers are used. The four to six pale bluish-green eggs are blotched and spotted with various shades of olive-brown, and perhaps under-markings of ash-grey. The black plumage has violet and green reflections; the base of the beak is covered with bristly feathers; iris dark hazel. Length, 19 inches.

The Hooded Crow—although a common Autumn and Winter visitor—also nests in all four parts of the British Isles, but is most common in Ireland. It closely resembles the Carrion species in its general habits, but is at once distinguished by the ash-grey plumage upon the back and under parts.

**Rook.**—The last member of the *Corvidæ* upon our list, but certainly not the least plentiful nor interesting, the Rook is known by sight to almost everyone, even if it is so often wrongly called a Crow. Rooks are distinguished by their social habits. They move about in companies; they nest together in what are known as Rookeries. These are early

nesters, and Spring cleaning of the old homestead takes place quite early in the year. The breeding season is usually all over by May. The manner in which the birds secure their large nests to the outside or thinner branches of tall trees need only be mentioned; but it should be stated that the structure is sometimes placed in low trees, and even laurels, and that isolated nests are by no means rare. The nesting materials mentioned in the case of the Carrion Crow also cover those used by the Rook. The four or five eggs are greenish, profusely mottled and blotched with dark brownish-green or some similar shade. They vary a good deal in size, colour, and shape.

Although the usual "caw" of this bird is so well known, it may interest the young naturalist to be informed that on occasions various notes are uttered of a pleasing nature. They "croo," Dove-like, in a pleasant manner, and also utter other curious sounds impossible to write down. Truly the ways of these wily feathered folk are vastly interesting, and a close study would reveal many interesting incidents. The apparently well-organized movements of these birds; the appointment of leaders; the assiduous and good work performed in the fields and meadows; the tendency exhibited for keeping to a certain rookery for a long period of years; the crafty habits, and, in a dry season, their love for the eggs of game-birds; the combats that take place for the possession of a neighbour's nest, or a few materials purloined from the same; early rising habits and diligent labours—such are a few points that might engage attention, and amply repay elaboration by the young student of Rookland life.

The glossy black plumage bears upon it reflections of violet. Although the young Rook is well feathered right down to the base of the bill, like a Crow, the adult has a characteristic patch of greyish-white skin, which should always be looked for when this bird is being watched. It may be seen with the naked eye at a short distance away, but when the birds are flying or feeding some way off, a good pair of field-glasses will be found indispensable. The Rook is 18 inches in length.

**Skylark.**—This favourite bird has already received a considerable share of attention in the opening pages of this chapter



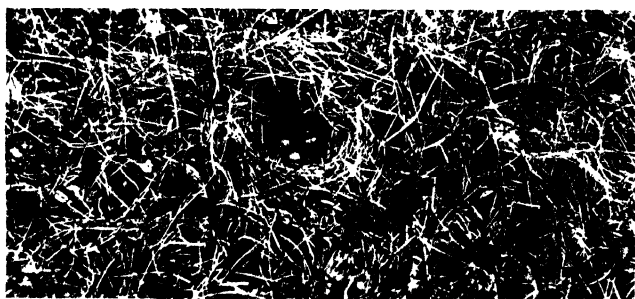
JACKDAW



POOKS



SKYLARK AND YOUNG IN NEST



NEST AND EGGS OF SKYLARK



SWIFT

(see pp. 140, 141)—at least, so far as concerns its song. It is not necessary, therefore, to add anything in regard to its wonderful powers in this direction, but it is important that the young reader should turn to the reference already mentioned if it has previously escaped his attention.

Holding a prominent position in the forefront of our British song-birds, the Lark has for long been regarded as a national favourite. The poets have sung its praises, essayists have given us delightful word pictures of its unfailing charm, and artists have striven to set before us the wee brown bird soaring majestically in the air, with the world at its feet. A lover of the air, "a scorner of the ground," as Shelley calls it, it is curious the bird should, after all, build its nest upon the earth. It is usually placed in a depression among grass or other herbage, and although not always well concealed, is extremely difficult to locate. Grass, with a lining of finer portions of the same, is used, and in the shallow structure four or five eggs are deposited. These vary in colour, size, and shape. Some are pointed; others are rounded. Some are light yellowish; others, again, are very dark brown. A general description may thus be given: whitish-yellow, grey, or yellowish in ground colour, closely freckled or blotched with darker grey, brown, or dark yellow.

Insects, seeds, and blades of grass and corn constitute the food. The plumage is brown on the upper parts; there is a faint streak of white over the eye; yellowish-white, tinged with brown, below. Length,  $7\frac{1}{4}$  inches.

## Order II.—PICARIÆ

**Swift.**—This small (so far as concerns the British Isles) but interesting Order contains the "Woodpeckers and their kin," as Dr. Bowdler Sharpe suggests might be the popular title employed. This being so, it will doubtless cause surprise to find the Swift at the head of the list. Reference has already been made to the previous irregular classification of the Swift among the *Hirundinidæ* in our essay upon the Swallow.

A late Summer migrant, and yet one of the earliest to depart,

the Swift passes a very busy existence among us, and although a comparatively common bird, a good deal has yet to be learned concerning it. No time has to be lost in commencing nesting operations, the breeding season taking place between the end of May and the first weeks in June. The nest is built under the eaves of houses and other buildings, as well as in ruins, pits, steeples, rocky cliffs, and elsewhere. It is composed of hay, feathers, and other materials, glued together by saliva. The two or three white eggs are rather large for the size of the bird, and measure 1 inch by 0.66 inch.

The food is exclusively insectivorous, and the wide, gaping mouth aids the bird materially in its insect-catching exploits. The piercing scream and rapid flight will be known to most people. The bird is a perfect marvel upon the wing, and its powers of endurance are nothing short of remarkable. Rapid as the flight is, Dr. Sharpe tells us that it is slow compared to that of a species he watched in India, which he likens to the rapidity of a rifle-ball. He, again, was told that the Indian species was far surpassed by another kind, whose power and dash may be described as akin to "greased lightning." While the outward structure and the life and habits of this interesting bird may appear Swallow-like, anatomically the bird is vastly different from the members of the *Hirundinidæ*, and is best placed among the *Picariæ*. The general plumage is sooty-brown; chin greyish-white; shiny black bill, feet, and claws. Length,  $7\frac{1}{2}$  inches. This may appear a short length for the Swift, but it is in its wing-stretch that one may be deceived as to size. It has a number of very curious names, such as Jack Squealer, Skeer Devil, Devil Swallow, Screamer, and Martin Du. In a way, this bird reminds one of the Nightjar, next to be described.

**Nightjar.**—A late Summer visitor like the Swift, the Nightjar resorts to far different haunts, and is mostly a nocturnal bird. It dearly loves to inhabit woods and the neighbourhood of the same, especially where there are clearings or fairly open country near at hand. Here it can pursue its insect-catching at the gloaming hour undisturbed. It is best seen upon the wing, and, similar to the Swift, strikes the observer as a larger

bird than it really is. This is due to the large wings. It possesses remarkable power upon the wing, and, excepting when it brings its wings high over its back and bangs them together rapidly, and so produces a loud report, the flight is noiseless. It lives chiefly on chafers and moths, and in catching these displays wonderful quickness and agility. It has a serrated claw upon the foot, and with this it is able to catch an insect when the bird is actively engaged in flight, transferring it to its hairy mouth without hesitation. The curious vibrating noise, or jarring warble, is one of the chief bird sounds to be heard of a Summer's evening in the haunts frequented by this bird. The male squats low upon the branch of a tree, and rattles his curious love-song whilst thus located. Then he will suddenly cease, and as he does so flies leisurely from his perch and darts and swoops through the air after some insect prey. I have watched the bird many times, and, when it has not been too dark, followed its movements with great interest. It is a bold bird, and I have had it dash at my head in no uncertain manner when I have had the audacity to encroach upon its haunts.

The two eggs are laid on the bare ground, no attempt being made to construct a nest. It loves bracken and stony tracts of country, and the eggs often harmonise so well with the surroundings that it is difficult to locate them. So it is with the sitting bird. She squats all day, sleeping, or snoozing, or brooding over her treasures, and is not put to flight till almost trodden upon; then the bird dashes about in a wild, bewildering manner, and one is glad to hie away and let her settle down once more. The oval-shape eggs are white, marbled and mottled with grey streaks, occasionally brownish, as well as black and lilac-grey. The following local names may be selected from the large number accorded: Fern and Churn Owl, Evejar, Goatsucker, Night Crow, Puckeridge, Wheel Bird, and Big Razor-Grinder. The general plumage is ash-grey, spotted and barred with brown, black, and chestnut. A large patch of white is present on the inner web of the first three primaries, and each side of the two outer tail feathers bears white tips. Length,  $10\frac{1}{4}$  inches.



**Lesser Spotted Woodpecker.**—I remember a red-letter day among my bird rambles when, during the course of one morning, I saw and heard all three British Woodpeckers—namely, the Great and Lesser Spotted and the handsome Green species. Whilst the young naturalist may not be so fortunate, any quiet tract of woodland should, at any rate, produce the present species and the Green. The Great Spotted is rarer with us in Hertfordshire than either of these, and does not call for detailed information. In the early morning I have watched and listened to the Lesser Spotted with keen attention. He is at all times an interesting bird, with his cheery and shrill note of “chee, chee, chee, chee, chee” oft repeated. The early part of the day, soon after it is light, is a magnificent time for noting the movements of our feathered population, and I would strongly urge all young people to undertake early morning rambles, especially in the Spring and Summer. The Great Spotted is  $9\frac{1}{2}$  inches long; the Lesser Spotted is  $5\frac{1}{2}$  inches only. It is whitish on the forehead and under parts; has a bright red crown; black nape, back, and wings, the latter barred with white; black tail, tipped with white and barred with black on the outer feathers.

The tops of tall trees are haunted by this bird, and here it delights in vigorously tapping for insects and their larvæ. It has, like all the Woodpeckers, a very strong bill, and this aids it in hewing out a hole as a nesting site, and also in securing its prey. It also possesses a very long tongue, which when drawn in is wound round the inside of the head in a very wonderful way. A hole in a tree is made, and the few chips that collect during the operation serve the purpose of a “nest.” The four or five white eggs measure 0·76 by 0·58 inch.

**Green Woodpecker.**—If there is a more handsome bird on the British list than a Green Woodpecker in good plumage, I have yet to make its acquaintance. This remarkably lovely bird is thus adorned: Olive-green above; yellow rump; greenish-grey under parts; crimson crown, back of head, and moustache; black face. The female does not possess so much crimson. Length, 13 inches.

The laughter-like, rippling notes of this handsome Wood-

pecker are a distinct feature of woodland sounds, whilst a sight of the beautiful creature running up a tree or shooting through some leafy alley is one of the most beautiful sights in Birdland. An examination of the coloured plate reproduced will at once convince the reader that I am not unduly exaggerating the claims of this bird, and, after all, a representation such as this is a poor apology indeed. Birds, without animation, lose much of their beauty and attractiveness. A hole is hewn out in a tree by this expert carpenter, the size being about  $2\frac{1}{4}$  inches in diameter. Chips that collect as boring operations proceed constitute the nesting materials, and upon these four to seven glossy white eggs are laid. These measure 1.3 inches by 0.92 inch.

The staple diet consists of insects (it is very fond of the Wood Ant and its eggs), nuts, fruit, acorns, and seeds.

The habits of Woodpeckers must come under personal observation to be of any service, and a written description can only convey a poor impression. It is, however, remarkable to notice how well adapted these birds are for their arboreal life, and how awkward they look when moving upon the ground, or flying jerkily when caught on an open tract of country.

Fights between the Squirrel and the present large species are not infrequent, the mammal having a partiality for the Woodpecker's eggs. I have always been at a loss to understand, however, how it was possible for it to secure them. Battles also take place between the Starling and this bird when the first-named wishes to appropriate the latter's nesting hole.

The carpentering habits and the voice are jointly responsible for a number of curious names, such as Awl Bird, Hew-Hole, Pick-a-Tree, Rain Bird, Whet-Ile, Yaffle, and Gally Bird.

**Wryneck.**—An early Summer visitor, the shrill notes of this bird, "pee, pee, pee, pee, pee," should be listened for in the woodland, or where trees abound, during the latter days of March.

A difficult bird to locate, unless its high-pitched and clear notes arrest attention, it is called in many parts the Cuckoo's Mate or Messenger, as it usually precedes the better-known harbinger of Summer, shortly to be described.

The nest is built in the hole of a tree, but this is not made

by the bird itself. Chips of decayed wood alone constitute the materials used. The six to eight oval-shaped eggs are glossy-white.

The food is mostly insectivorous, but the bird is also stated to be fond of elder-berries. The long tongue is of great service in enabling it to lick out insects from their hiding-places among bark and other positions. The habit the bird has of rapidly turning its head from side to side has resulted in the bestowal of its English name of Wryneck. When approached, especially in the vicinity of the nest, the bird hisses in no uncertain manner, and throws its body into extraordinary contortions.

The plumage is reddish-grey on the upper parts, irregularly spotted, and lined with brown and black. There is a broad band of black and brown running from the back of the head to the back; dull-white under parts, tinged with buff; arrow-headed markings on breast and belly; tail feathers with black bars and zigzag bands. Length, 7 inches.

**Kingfisher.**—Considered by many people our most beautiful British bird, the Kingfisher as an animate being is undoubtedly a gorgeous creature. Anglers have fine opportunities of seeing this bird, and I have myself watched it careering swiftly over the water on many occasions. Once I remember one bird came dashing down-stream at break-neck speed; then suddenly pulled itself up, hovered like a large green and brown butterfly or moth, and then made a dart at my float! It was a little episode, but one of those quiet incidents which go to make the art of angling so enjoyable.

In view of remarks made elsewhere as to the songs and plumages of birds having a great effect at the courtship season, we are somewhat negatived in this view by the Kingfisher; for both sexes are equally beautiful, and the bird does not possess any captivating song, only a shrill and piercing note being uttered on the wing.

Here is a problem in the Bird-world near at home that requires elucidation. I candidly admit I am myself puzzled, but it is one of those exceptions to a general rule that crop up in Nature, and which admirably illustrates, at any rate, that there is no finality in the absorbing study of wild creatures'



KINGFISHER



YOUNG CUCKOO IN NEST



ways. The plumage may thus be stated: Back, azure-blue; head and wing coverts, bluish-green, spotted with azure-blue; a red band under and behind the eye, merging into white, and below this a band of azure-green; wings and tail, greenish-blue; throat, white; orange-red under parts. Length,  $7\frac{1}{2}$  inches.

Where some quiet stream meanders through the green meadows, or hard by some rush-fringed lake or pool of water, there one may stalk this lovely bird. One may sight it at any point, for, unlike the Dipper of the burns and valleys and the Robin of our gardens, the Kingfisher has no restricted range. He is up and down stream without exhibiting any partiality for a given area. I have noticed, however, that favourite watch-towers are chosen from which the fishing exploits may be carried out. I have watched one of these birds on many occasions perched on an old railing which runs well into a lake of my acquaintance. I chanced at a favourable opportunity to be in a boathouse, from which a fine view could be obtained without the bird being aware of my presence. There he sat below me, like a little old man, with shrugged shoulders, stumpy body, and massive beak. He was quietly watching the movements of some Dace who were continually swimming to the surface of the pool to bathe their bodies in the Summer sunshine. There was no hurry; the feathered fisherman was content to wait his opportunity. I almost tired of watching him as he sat there. He tried my patience to the utmost, and then, when least expected, he darted off his watch-tower, dashed at the affrighted fish, who scattered in all directions, some leaping out of the water in very fear. The bird emerged triumphantly bearing two or three fish in his dagger-like beak.

A flash of azure-blue, green, and orange-red, a sudden splash as the bird touched the surface, a plunge, and away went the bold Kingfisher down-stream on fast unerring wings to convey the silvery Dace to its hungry youngsters waiting expectant at the mouth of the nesting hole. A hole in a bank by some river or sheet of water is usually chosen, but sometimes the nest is found some distance from the water. The hole made by a Water Vole, or even that of the industrious little Sand Martin, are also chosen.

The nesting materials consist of the ejected bones of small fish. It is not a particularly tidy nor clean homestead, and the six to eight fine glossy-white and almost round eggs look strangely out of place among such surroundings. The young are most curious and often ludicrous looking creatures, with their stumpy feathers and general dissimilarity to their handsome parents. Besides fish, aquatic insects and tadpoles are partaken of.

**Cuckoo.**—Much might be written of this wandering bird. It comes to us at the best season of the year—mid-April—and the adult birds leave quite early in the Autumn or late Summer, leaving the young to find their way across unknown oceans and continents as best they can. This, apparently, they admirably succeed in doing. As is well known, the Cuckoo does not build a nest of her own. She lays her egg upon the ground; then picks it up in her beak, and flies off with it to the nest of some small bird, and there deposits it. It was long thought that the egg was laid in the nest, but this has now been thoroughly disproved.

When it is stated that the egg has been found in the nest of the Brown Wren and Long-Tailed Tit, however, it will at once be seen that it was a physical impossibility for the egg to be actually *laid* in the nest. Once the female Cuckoo has placed her egg in the nest of some other bird—such as a Hedge Sparrow, Robin, or Meadow Pipit, three very favourite foster-parents—she takes no further heed of it, so far as is at present ascertained. The little birds upon whom the strange Cuckoo thrusts her charge take no notice of the new deposit among their own treasures; indeed, they have actually been known to throw out their own eggs in favour of that of the foster-child. It is remarkable to notice here that although the Cuckoo is as large as the Sparrow Hawk, and, indeed, a somewhat similar looking bird, the former only lays an egg about the size of an ordinary Sparrow, whilst the Hawk lays an egg as large as a golf-ball! Here is a wonderful provision which Dame Nature has thought out for the preservation of one of her feathered children; in fact, the whole life-history of this bird of perennial interest is absorbing and shrouded in a good deal of mystery.

To return to the subject of the egg: in due course this is incubated by the foster-parents. The young intruder is found to be well-developed even at an early stage in its existence, and it soon grows apace. It possesses a prodigious appetite, has wonderfully strong limbs, sensitive wings, a foot possessing two toes in front and two behind; but, what is important to remember, it is blind for the first few days of its life. Strange to relate, however, long before it has received its sight—indeed, during the first twenty-four hours of its life—it has the habit of throwing out from the nest in which it is born anything and everything else which receives refuge there. If there be eggs of the foster-parent in the nest when the young Cuckoo is hatched, they are doomed to be ejected; if there be young birds in the nest, they also will undoubtedly be thrown out. If, again, two Cuckoo's eggs are hatched in the same nest, both birds fight like young demons until only one remains and the weakest perishes.

The babyhood of the young Cuckoo is indeed one of the most remarkable episodes in the whole pageant of bird-life. Few people, however, seem to be able to catch the young rascal in the act of turning out its foster brothers and sisters or the eggs. For over one hundred years controversy raged as to whether this strange habit did or did not exist, and it was not until the camera was introduced into Nature that the matter was once and for all set at rest. At a *conversazione* of the Royal Society, held at Burlington House in 1905, I was honoured by an invitation to personally exhibit and explain a series of photographs, taken from life by Mr. J. Peat Millar, illustrating the young Cuckoo in the very act of ejecting both eggs and young birds from a Meadow Pipit's nest. These attracted considerable attention; several of the well-known daily and weekly London papers afforded prominent notices thereto, and I was further honoured by a request from the Trustees of the British Museum to present a set of the photographs for permanent exhibition at South Kensington, where they may now be seen. For a detailed account of the exact methods employed in this ejection business, and photographs illustrative of the strange habit, I must refer the reader to my



brochure, "The Early Life of the Young Cuckoo," published by Thomas Burleigh.

Fed as it is on hairy larvæ and insects, the young Cuckoo soon fills out the nest in which it is born; indeed, in many instances the structure is too small to hold him! Bear in mind that during the whole time the bird is blind it possesses the insatiable desire to eject anything from the nest, but as it receives its sight, that strange craving ceases as suddenly as it commenced. Having obtained its sight, the feathered Philistine will permit any young bird to live in perfect harmony with it—a curious change from the extraordinary behaviour during the first ten days or so of its life. The foster-parents pay no heed to the destruction of their own progeny, but rather increase their efforts to rear their fine foster-child, and even then find their energy and strength taxed to the utmost. Opinions differ as to the number of eggs laid in a season by one female, or whether the same bird deposits two eggs in one nest. The egg varies, but not to the same extent that some writers assert. A general description might thus be given: pale greyish-green or reddish-grey, closely spotted, mottled, and speckled with darker shades, and often a few black spots. Some varieties closely resemble the eggs of the House Sparrow and the Skylark. Blue varieties of the Cuckoo's egg have been found and identified, which were placed in the nest of a bird laying blue eggs. This opens up a most interesting question too elaborate to be discussed here. Whilst I myself have noticed how very similar some eggs of the Cuckoo are when deposited in the nest of the Meadow Pipit, Skylark, and Tree Pipit, others I have noticed in strong contrast when placed in the nest of a Robin or a Hedge Sparrow.

Both the male and female adult birds utter the well-known cry; a sort of chattering or gurgling note is also made during the courtship season. The plumage is bluish-ash on the upper parts and whitish below; the blackish tail feathers have white spots and tips; the breast is streaked prominently with dusky markings; inside of mouth brilliant yellow; iris and feet same colour. Length,  $13\frac{1}{2}$  inches. The young bird is ash-brown, barred with reddish-brown, and has a white spot on the back of the head.

**Order III.—STRIGES**

**Barn Owl.**—This important Order of birds, containing as it does some most useful feathered fowl, is not an extensive one so far as concerns our own country, and it will not detain us long to run through the four or five species that we have among us. Classified between the "Woodpeckers and their kin" and the Accipitres, or Birds of Prey, Owls are generally distinguished by their mostly nocturnal habits, soft and downy plumage, curious facial expression, and noiseless flight. The Barn Owl is the first species on our list, and is perhaps the most beautiful and the most useful of the five British members of the Order. Although we only deal here with three of the commoner species, it should be mentioned that the Short-Eared Owl and the Little Owl both nest among us. The former is diurnal in its habits, and is very locally distributed; the latter has been introduced, and is certainly extending its range in various directions. It is a really delightful little creature, but, in spite of its small size, is accused by gamekeepers of perpetrating harm among their preserves.

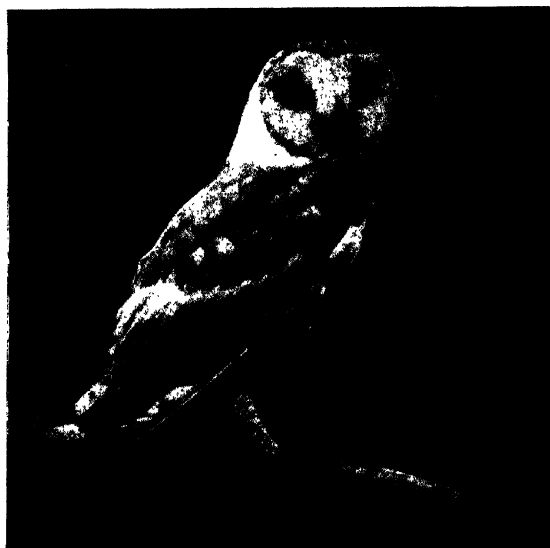
The Barn Owl is tawny-yellow above, with variegations of grey, brown, and white; white face and lower parts, with the margin feathers tipped with brown. Length, 14 inches. The voice and the plumage are both responsible for several interesting local names having been bestowed, such as Cherubim, Cream-Coloured Owl, Hissing Owl, Screech Owl (a very common name this in many districts), and Madge Howlett. This species snores, hisses, and hoots, and snaps the bill when alarmed or angered. The nesting haunt is usually an ivy-clad ruin, church tower, barn loft, hollow tree, or other similar place. The three or four white eggs (two are laid at a time—that is, two that are hatched, and then a second clutch) are deposited in a mere apology for a nest. This latter is composed of decayed wood, or similar materials found in holes of trees, and the pellets that the birds disgorge. Occasionally its own discarded feathers are also used.

The food is made up of rats, mice, insects, moles, and shrews. In reducing the number of Rodents, such as Rats and Mice, this

bird does incalculable good, and could its deeds be closely watched during the daytime, there is little doubt a better opinion would prevail concerning the benefits it confers upon mankind generally. Although I often see the bird shot and trapped, and it is accused by my gamekeeper friends of being an enemy to game, I cannot bring myself to believe that this species is as harmful in this respect as the Tawny or Brown Owl, and even that species, I venture to state, does more good than harm.

**Long-Eared Owl.**—An inch more in length than the Barn Owl, the present species tenants woods to a much greater extent, appropriating the deserted nest of a Crow, Sparrow Hawk, Ring Dove, Magpie, or Squirrel. It is an early nester, the four or five rough-textured eggs being laid very often as early as March. I have known young ones fully feathered in April. Fonder than the Barn Owl of birds such as Larks and the young of other species that need not be mentioned, the present Owl may be distinguished from any other British relative by the possession of long ear-tufts, a slender body, streaks of black on the feathers of the breast, and blackish cross-markings on the plumage. It loves pine and fir woods, and here it may be sought for during the twilight hours with almost certain success. The strange mewing and short, barking cry is bound to attract attention during the shadowy stillness of the evening hour, and contrasting strangely with the mellow hoot of a Tawny Owl a few paces away. Plumage: beak blackish; eyes orange-yellow; buff-colour above, mottled with grey and brown and streaked with dark brown; former colour on facial disc, with greyish-black on margin and outer rim; warm buff and grey on under parts, with blackish streaks and small transverse bars.

**Tawny Owl.**—This is our largest British Owl, and measures 16 inches in length. It is more often called the Brown or Wood Owl. A great lover of woods and plantations, the loud, weird hoot of this species is one of the features of the country sounds to be heard during a Summer evening's walk. The note uttered may thus be given—"hoo-hoo," and then "hoo-hoo-hoo." The bird also gives vent to a low whistle when it is pleased. A large hollow tree is the usual nesting site,



BARN OWL



TAWNY OWL



LONG-EARED OWL



YOUNG LONG-EARED OWLS

but the old nests of other birds are appropriated, as in the case of the last species, and barns and outbuildings are also chosen. The three or four large white eggs are much more rounded than those of any other British species, and measure 1·8 by 1·52 inches.

I have known several keepers who have vowed never to shoot or trap these birds again. This decision has been come to as a result of the Rats and Rabbits that have been found in the nests, and the large number of pellets that congregate in a long-tenanted haunt. I have myself seen full-grown Rats and Rabbits in a nest of this Owl. It is remarkable to reflect as to how it is possible for such a comparatively small bird to kill and carry a full-grown Rat or Rabbit to its nest in a tall tree, an able testimony to the useful work performed in keeping in check these harmful Rodents. That the Brown Owl has a great liking for young game and other birds seems to be generally admitted, but, judged all round, it may safely be stated that the bird does far more good than harm. To be able to closely follow any nocturnal Owl in its daring exploits would be a rare treat indeed. We can watch the Sparrow Hawk pursue his prey, and see the small birds scatter in all directions; we can see the Kestrel hover, and then dash down to the ground and secure its victim; we may, if fortunate, see the Golden Eagle, the Buzzard, the Raven, the Merlin, the Hobby Falcon, or the beautiful Peregrine, sailing majestically in the blue ether above, then quartering the ground, or hunting and securing prey in the manner peculiar to each. The work of the Owls, however, is performed at nightfall, when all is still. Their foraging expeditions are carried out noiselessly and silently, and we really do not know, excepting as the result of an examination of the disgorged pellets of indigestible food, what highly beneficial work these feathered police perform. It should be the aim of everyone to protect and preserve them, and, thanks to the better understanding that now exists in regard to the important part birds play in the economy of Nature, the time does not seem far distant when this most useful family of birds will be much more esteemed than has been the case of recent years. The plumage is reddish-brown above, marked

and spotted in various shades of brown, grey, and black; reddish-white on under parts; legs feathered right down to claws; beak greyish-yellow.

#### Order IV.—ACCIPITRES, OR BIRDS OF PREY

**Common Buzzard.**—Whilst our British birds of prey are now comparatively few, and several interesting forms, such as the Kite and the three Harriers, are on the verge of extinction, it is encouraging to know that the Golden Eagle is increasing and that in many parts of our country the Buzzard and the Peregrine Falcon may still be found. The Eagles, Kite, Harriers, Hobby Falcon, and Osprey all belong to this important Order of Nature's balance-keepers; but none of these can be listed among our commoner birds, and the mere mention of them must suffice.

If the young naturalist desires to see the Common Buzzard in its own wild fastness, he must go to Wales or Scotland. In England and Ireland it is practically exterminated as a nesting species. In certain parts of the Principality it is found in good numbers, and a friend of mine well known in the Bird-world saw at least a dozen pairs on a recent visit. Keepers generally still appear to have a distinct hatred of any bird in the form of a Hawk or Owl, and it is owing to their efforts in a large measure that the Buzzard's status among us has been so much reduced. I had a magnificent male bird brought to me a few years ago which was shot in a Hertfordshire wood by a game-keeper of my acquaintance. It was in a remarkably fat condition, and ably testified to the character of the rich game preserve whence it had come. The pitiable part of the story is that a pair of the fine birds had been seen in the neighbourhood of a large wood for some little time, and the chances are that had this one not been shot they would have nested in the district. The keeper was particularly proud of his feat, although it was at that time a penal offence to kill a Hawk or an Owl upon the estate.

The slow but majestic flight of the so-called "Common" Buzzard, and the rugged nature of the haunts it frequents, combine to make the bird of intense interest to the bird-lover.

The note, too, a sort of melancholy whistle, is in keeping with the surroundings frequented. The food is snatched from the ground, but the bird does not exhibit the dash and courage of some of its near relatives. It consists of insects, birds, reptiles, and small Mammals. The bulky nest is placed in tall trees, in woods and forests, and rocky situations by the sea. It consists of large and small sticks outside, and is lined with leaves, dry grass, and wool. When the structure is built on a cliff, it is placed either on a platform or at the base of a tree growing from the side. The two to four eggs are white, faintly tinged with pale red or blue, streaked, spotted, blotched, splashed, and clouded with reddish-brown and under markings of purplish-grey.

As a general rule among the birds of prey, the female is larger and more powerful than the male. In the Buzzard the female measures about 22 inches and the male 2 inches less. The bird is dark brown on the upper parts of the head and neck, with a mottling of a still darker shade; beak lead-coloured; cere, irides and feet yellow.

**Sparrow Hawk.**—This is a much commoner bird than its larger relative last described, and if you ask a keeper he will tell you that it is one of the very worst feathered enemies he has. It nests from April to June, and places its shallow structure (unless it appropriates the deserted nest of a Jay, Crow, or other bird) in trees and bushes, as well as upon rocks and sea-cliffs. The five eggs are often very handsomely marked. The whitish ground colour is blotched, usually at the larger end, with rich reddish-brown. This Hawk preys upon Mice, Moles, Slugs, Beetles, and Birds. The note is a harsh, screaming call.

The male is dark bluish-grey above and reddish-white below; beak blue; feet yellow. Length, 12 inches. The female is brown above and greyish-white below, barred with dark grey. Length, 15 inches.

**Peregrine Falcon.**—Along some of the rocky parts of our coastline this bold, daring, and beautiful Falcon still nests, whilst other haunts are trees, in which the deserted nest of a Crow or some other bird is taken possession of. The materials



used in the former case are Rabbit flick, sticks, straw, and bents. The four eggs are reddish-brown, blotched and variegated with a darker colour. This is a wonderful bird of prey, and its powers upon the wing are remarkable. It was much sought after in the days of Hawking, and being a bold, fearless bird, most graceful and majestic when carrying out its aerial exploits, and a really beautiful bird as well, it is small wonder it was such a general favourite. The prey consists of various sea and land birds, such as Partridges, Snipe, Ducks, Jays, Magpies, and the smaller members of its own Order, such as the Kestrel. The rugged headlands and other precipices and rocks frequented by this Hawk add much to the bird's attractiveness, and I have, with bated breath, watched the pair that have for so long nested at Beachy Head, in Sussex, with great interest. The sharp note is emitted two or three times successively, and is somewhat similar to the words "kek, kek, kek." The male is dark bluish-grey above, with bands of a darker colour; bluish-black head and moustaches; white under parts; transverse brown bars on breast; blue beak, darker at tip; yellow cere; dark brown iris; yellow feet; black claws. Length, 15 inches. The female has a brown tinge on the upper parts and reddish-yellow below. Length, 17 inches.

**Kestrel.**—This handsome little Hawk, probably the commonest species included in the Order, may thus be described: Male, dark leaden-grey above; light yellowish-red, with narrow dark streaks on sides, wings, and under tail coverts; blue beak; black claws. Female, light red above, as also on tail; paler underneath than the male bird. Length, 15 inches. The nest of some other bird, such as a Magpie or Crow, is generally appropriated by the Kestrel when the bird nests in a wood, but other nesting haunts resorted to are church towers and both inland and marine cliffs. The four pale reddish-brown eggs are mottled with a darker tint, and some varieties are particularly handsome. The food consists of Rats, Mice, Birds, Frogs, Snails and Beetles.

Although the Kestrel does commit some damage among young game-birds, I have long since come to the conclusion that the keeper persecutes it beyond reason. I could tell of



KESTREL



NEST AND EGGS OF SPARROW HAWK

*PLATE XLV*



CORMORANTS



GANNET

many pathetic incidents as to the destruction of the parent birds and their young by gamekeepers, but will spare the young reader on the present occasion. To farmers and land-owners it is unquestioned that this Hawk is an unmistakable boon, whilst as a natural balance-keeper its claims should not be overlooked. It does not possess the bustling habits of the Sparrow Hawk, and its local names of Windhover and Hover-Hawk testify as to its habit of hovering. It is a rare sight to observe the bird high up in the air, a mere speck as it were. Then, as it gradually comes down, one can better follow the deliberate movements, and perchance be fortunate enough to see the bird dash down eventually and secure its prey.

The note uttered is best described as a sharp, ringing, half-laughing cry.

#### Order V.—STEGANOPODES

**Cormorant.**—This species introduces us to our first sea-bird, and even if neither the present representative nor the Shag are to be commended for their cleanly habits, they are most interesting in other ways, and add a charm to bird rambles in the neighbourhood of the sea and seashore. The Cormorant nests in colonies, placing its large structure of sticks, seaweed, and dead grass upon the ledges of sea-cliffs, or, when found inland, in tall trees or bushes. The four to six eggs are of a white chalky nature, but when this substance is removed the shell is bluish-green. Fish and Eels constitute the food, and the bird is a good fisherman. This may cause some surprise to those who have observed it sitting quietly on some rock or shore, hour after hour, shrugging its shoulders, or preening its feathers. The harsh scream cannot fail to attract attention, and may be heard above the tumult of the breakers. The call note is compared to the words "kree," "kraw," or "krell." Many curious names have been accorded, the strangest of which is that of Isle of Wight Parson.

The white throat and the white patch on the thigh in Spring-time, the otherwise black plumage, and the crest upon the head, at once enable identification to be made. The female is

brighter than her mate, has a longer crest, and is a bigger bird. Length, 36 inches.

**Shag.**—This species may be distinguished from the last-named by its smaller size (length, 27 inches); dark green crown, neck, and upper and under parts, with purple and bronze reflections; black wings and tail; and the absence during the breeding season of the white patch on the thigh. In the Spring it possesses a crest, but this is lost in May.

It is known also as the Green Cormorant and the young as the Crested Shag. It may be found more in the neighbourhood of the sea than its relative, but is not so common. The bulky nest is placed in holes, ledges, crevices, etc., of rocks and sea-cliffs, and is composed of somewhat similar materials to the last-named species. The three to five eggs are white when first laid, but soon become soiled. A harsh kind of croak is uttered. The food consists of fish.

**Gannet.**—The Bass Rock, in the North Sea, and that bold promontory known as Ailsa Craig, in the Irish Sea, are two of the British strongholds of this fine bird. I have passed many pleasant and profitable hours in the neighbourhood of both, and watched the Gannets with much interest. The bird looks best upon the wing, and it is a wonderful fisher. It soars to a great height in the air, and, having reached a certain altitude, again soars still higher, and then, with a magnificent plunge, down it comes. The bird must of necessity possess remarkable focussing powers to be able to penetrate from such a lofty eminence into the water beneath. That it has this wonderful sight is obvious if one watches the Gannet's movements, for having plunged into the sea and become temporarily lost to view, it will soon be seen emerging triumphant with a fish held crossways. Many interesting incidents are connected with this fishing by the bold sea-bird, and it should be carefully watched if a full measure of enjoyment is to be obtained. Thousands of pairs nest on the Bass Rock every year, and off the Irish coast it is possible, during the breeding season, to see two or three acres of living birds!

\* The Gannets return to the Bass for nesting purposes with unfailing regularity. Only one egg is laid in a dirty nest com-

posed of seaweed, grass, straw, and similar materials. It is covered with a white chalky incrustation, but when this is scraped off, the shell displays a bluish-green colour.

Herrings, Mackerel, Sprats, and Pilchards are favourite fishes. The harsh cry, so characteristic of the murmuring sea and the rocky fortresses the bird frequents, is something like "carra-carra-carra." The general plumage is white, with buff on the head and neck; the primaries are black and the beak formidable. The young are blackish-brown above, flecked with white, and dusky ash and buff below. This is the first year's attire. At the sixth year the dark markings depart, and the plumage of the adult is assumed. Length, 34 inches.

#### Order VI.—HERODIONES

**Heron.**—This is the sole representative of this Order of birds in our country. Social in disposition, the Heron generally, but not invariably, builds its large nest in companies, called "Heronries." The structure may be somewhat compared to that of the Rook, but is larger. The three or four eggs are uniform dull greenish-blue. The young are peculiar-looking in their early stages, and even at quite a tender age have strong, powerful beaks, legs and feet.

The diet is made up of fish, reptiles, rats, insects, and snails. The bird is very fond of rats, and also eels. It is accused—and not without reason—of doing harm to Trout, but I must confess that I have found the fish plentiful in the streams where this bird's haunts are located. To see a Heron standing sphinx-like is a study. I have watched the bird many times, either by the side of some sequestered pool, or on the Norfolk Broads. I have seen it standing just in the water, with the head buried in the shoulders, and to all appearances enjoying a sleep in an upright position. Remaining perfectly motionless, the bird might easily escape detection in this way, reminding one of a grey post by the water-side or in the lush meadows. He has a wise old head, has this bird, for he is by the water for some purpose. He is intently watching for the opportunity of thrusting out his bayonet-like bill and transfixing some fish or rat. When he is fishing he contrives sometimes to beat the

water with his broad, strong wings, and thus drive the fish into a shallow part where he can more easily capture them. Undoubtedly a useful bird in many ways, it is to be regretted that some keepers will not permit this bird to nest on their estates when it shows a desire to do so. It is when upon the wing this bird looks at its best. Rising slowly and deliberately, it soon obtains full control of the air, and with its large wings spread out to the utmost, and long legs carried behind the body, it presents an attractive appearance. When approaching the nest it will, when watched, fly round and round for quite a long time before settling down. The cry is harsh and powerful, and might be mistaken for that of the Peacock.

In many parts of the country it is known as a Hern and Mole Hern. It stands 3 feet high, and has a bluish-black crest; it is slate-grey on the upper parts; forehead, cheeks, and neck white, streaked with bluish-grey, with long white feathers on the neck; greyish-white under parts; yellow bill.

#### Order VII.—ANSERES

**Mute Swan.**—This is the only Swan that nests in the British Isles, and most pairs that do so are really semi-domesticated. The reader will be aware of the number of these birds that find a home on ornamental sheets of water and other places. Early in Spring a commencement is made with the huge nest. This is composed of rushes and reeds, and is often of very large dimensions. When the female is sitting upon her six or seven large greenish-white eggs, the male becomes very vicious and ill at ease when an intruder appears. A blow from a Swan's wing is something to be remembered, and although one hears various stories of the bird's viciousness, a friend of mine took an egg from a sitting bird without the slightest resentment on the part of either bird. The graceful carriage of this snow-white creature as it glides through the water is well known, whilst, when flying, the long outstretched neck, large body, wide wings, and black legs and feet all aid in presenting a very curious appearance. The bill is reddish-orange; nostrils, lores, tail, and basal tubercle black. The male is a trifle the larger bird. Length,



COMMON HERON



MULT SWAN AND CYGNETS





60 inches ; weight, about 30 pounds. The young are called Cygnets.

The food mostly consists of aquatic plants, but a few water insects and Molluscs are probably swallowed without the bird being aware of it. When kept in confinement the Mute Swan does not belie the forepart of its English name, but in a wild condition a loud trumpet-like note is uttered during the pairing season. It seems somewhat strange that, although we have so many Wild Swans that visit us during the Autumn and Winter, the present species is the only one that nests among us.

**Wild Duck.**—The male of this Duck (known as the Mallard) is a very handsome bird, and may thus be described : Green head and neck ; white collar, and four curled feathers of the same colour in tail ; deep chestnut breast ; greyish-white belly ; orange-red legs and feet. Length, 24 inches. The female is smaller and much more mottled-brown and buff in colour. It is curious to notice that when the male moults his feathers (in early Summer), he goes into hiding, forsakes his mate, and comes forth in the garb of the female. This dress is only temporarily assumed, however, for later in the year he again changes his attire, and puts on the very handsome plumage above described.

A large number of Wild Duck are reared in various parts of the country for sporting purposes, and it is an interesting sight to watch a number of these birds in such a district as they fly with outstretched necks round and about the water they have made their home. They are rapid and strong flyers, and I have noticed how cumbrous they appear when first they leave the water and take to the air, but how well they propel their bodies when fairly on the wing. When in a company the leader may be seen in front, and the birds fly in a sort of V-shape, which strikes one as very curious when observed for the first time.

The nest is usually placed among rushes and other aquatic herbage near water. This, however, is not always so, as I have found the nest in a wood or in a field some distance from water of any kind. It is made up of reeds and grasses.

The eleven or twelve eggs are pale green. Frogs, fish, grain, and aquatic insects constitute the dietary, but other things are doubtless eaten difficult to identify. The call is a "quack," also "quork," or "dree-k, dree-k."

**Eider Duck.**—There are several other species of birds included in this Order that nest among us, but most of them are either rare or very sparsely distributed. Such being the case, they are not likely to come under the notice of the young naturalist, and we may pass on to consider four much commoner birds belonging to the *Columbæ*, or Doves. It might be noted, however, that one of the members of the Order *Anseres*—i.e., the Eider Duck—is of great service to commerce, for it is from the down of this bird that eiderdown quilts are manufactured. It is a handsome Duck, and nests in the north of our island. It is a sea-loving bird, and rarely comes to land excepting at the breeding season. The large nest is lined with down, which the parent plucks from her own breast during the time the eggs are being incubated. When the nest is left the latter are carefully covered over.

#### Order VIII.—COLUMBÆ

**Ring Dove.**—This is quite the commonest Dove that nests with us, but is much better known as the Wood Pigeon. In many districts this bird is increasing enormously, and is accused of perpetrating considerable harm in its partiality for young turnips, leaves, roots, and grain. A number of obnoxious weed seeds are also eaten, as well as beech-mast. The bird is a voracious feeder, and I have seen a cap full of young turnip and clover taken from the crop of one bird. In the Autumn and Winter months very large flocks of these birds may be seen in various parts of the country, and in the Summer numbers may be observed feeding together in the cornfields and other places. Charlock is a very favourite food of this bird. A pure wild Ring Dove is really a very handsome bird, and as seen through a pair of good glasses is worthy of much attention. The head is bluish-grey; sides and back of neck violet and green, with a white patch on each side; grey above; reddish-purple on under parts; paler on belly; the orange bill

is whitish towards the base ; bright red legs and feet. Length, 17 inches.

This is an early nester, and I have known young in the nest long before April's lease had commenced to run out. The frail nest of small dead twigs is built in fir and other trees, as well as tall hedges. It is a flat structure and quite unlined. The two white eggs are oval in shape, and measure 1·65 by 1·25 inches.

The note is very loud, and often continued for some time. I have long interpreted it as "Don't scold so, Sukey," and I hope I may be so understood. It is a rougher and much louder note than the soft, agreeable "croo" of the Turtle Dove. The Ring Dove is a very timid and restless bird. It rises from the nest or tree in which it may be located in a flurried, noisy way, and contrasts very strangely with the Turtle in this respect. It is a powerful flyer, and appears to enjoy rushing through the air and then free-wheeling, as it were. It has a much more continued flight than the Turtle, and, indeed, its general habits are such that one might well imagine there was no close relationship existing between the two birds. It is interesting to notice that these birds do not drink as birds in general do, taking a draught of water like a horse. They also feed their young in a different manner, regurgitating the soft portion of food from the crop and thrusting the beak right into the fledgeling's mouth.

In Scotland this species is known as the Cushat Doo, whilst other local names accorded are those of Oodal, Luest, Luince, Zuist, and Wood Lueest.

Among the turmoil of London this bird builds its nest and rears its young, and is increasing in many of the parks and open spaces. It seems strange that such a timid wild bird should forsake its fastness in the greenwood, and migrate to the great Metropolis in this way.

**Stock Dove.**—This Dove frequents woods and cliffs, and when flying may be mistaken for the last-named species. This also applies to the Rock Dove, next to be described. The Stock Dove, however, is a smaller bird, measuring 13½ inches only, and the Rock Dove is a smaller bird still, measuring

1 inch less. It is important in those birds that may be confused to give a full description of the plumage, more especially so among the members of this Order. The plumage of the present bird may thus be described: Head, throat, wings, and lower parts, bluish-grey; wine-red breast; tail, grey, barred with black near the end, with a spot of white on the outer web of the outer feathers; reddish-brown iris; yellow bill, red at the base; red feet.

Unlike the Turtle Dove, a late Summer Migrant, the three other species nesting with us make an early commencement at nest-building. The Stock Dove begins operations as soon as February. Sticks and twigs are used when a nest is built, but in sandy districts the two white eggs are often laid in the burrow of a Rabbit, no attempt being made to construct a homestead.

The note is a kind of continuous murmur, and the food consists of various seeds and leaves, as well as acorns, beechmast, worms, and snails. I have noticed this species very prominently on the far-famed cliffs off the Yorkshire coast, especially at Bempton, Speeton, and near Flamborough Head. Those of my readers who have never visited the coastline of the County of Broadacres should not fail to do so when opportunity presents. The coast teems with bird life during the nesting season, and at other times of the year many rare and occasional visitors from the Far North may be observed along the shore or in its near vicinity.

**Rock Dove.**—This species is not so well known as its relatives, for it frequents the rocky parts of our coast, more especially in Scotland. It possesses remarkable flight powers, and is stated to traverse a distance of seventy miles every day to feed—from St. Kilda to the Hebrides. The note somewhat resembles that of the Ring Dove, but with a sort of "roo" mingled among the "coos." Whilst not by any means a great vocalist, it is pleasant to hear the plaintive note among the incessant din made by a host of sea-birds and the murmur of the ocean. The food resembles that of the last-mentioned

\*species.

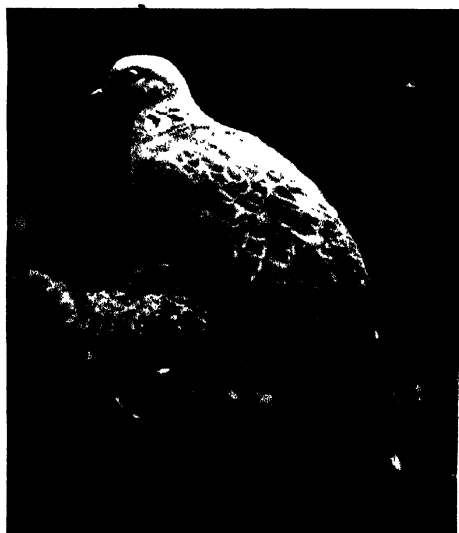
The face of high cliffs, ledges in rocky caves, and similar



*PLATE XLVII*



WILD DUCK ON NEST



TURTLE DOVE

places, are used as a nesting site. The nest is built of grass, seaweed, dry bents, and a few pieces of heather. The two white eggs are not quite so large as those of the Ring Dove. The general plumage is ashy-blue, lighter on the wings; rump, white; remarkable lustrous neck and breast; two transverse bands of black on wing; primaries and tail tipped with same colour; white on outer web of outer tail feathers; iris, light orange; bill, black; feet, red. Length,  $12\frac{1}{2}$  inches.

**Turtle Dove.**—A common Summer visitor to the wooded parts of our island, the soft, agreeable, and delightfully rural note of this bird may be heard during late April or early May. It is a much easier bird to observe and to study than either of those previously mentioned, and seems very conscious of protection. The nest, I find, is usually placed in a low tree or high bush, and numbers sometimes build quite close together in a little colony. The two beautiful milky-white eggs, flushed with pinkish, look most chaste when lighted upon in the frail structure of twigs and sticks. Unless the nest was placed in a wood or thick protected bush or hedgerow, it is evident that the eggs would be subjected to the severities of wind and bad weather. The nest is quite flat, and it is a wonder the eggs do not frequently meet with disaster.

When the Turtle is discovered on her nest, she slips off very quietly and unobtrusively, and will not fly very far away. When flying, the bird may at once be distinguished by the fan-like dusky tail, and the prominent white edges on the same. The general plumage is brownish above and white belly; black and white patches on neck. Length,  $11\frac{1}{2}$  inches.

During the Summer and early Autumn I frequently disturb a number of these birds feeding in company upon some waste land where Nature has been permitted to run riot, and where numerous weeds flourish abundantly. Here the Turtles partake very largely of seeds, and when a number of the birds are put up the effect of the soft plumage, fluttering flight, and spread-eagled tail are very attractive to watch. The bird also eats insects and snails, and although I have actually known it to strike at and kill a young Pheasant, it seems a very harmless species—indeed, I think performs a considerable amount of good.



Many keepers, I know, have a warm place in their affections or the Turtle Dove, and it has long been a favourite among the poets for its supposed felicity, and as an emblem of faithfulness in love. I know of several other birds that are quite as emblematical of the stated faithfulness as the Turtle, some of them pairing for life, but about which we hear very little. It seems strange, therefore, that the present Dove should have been singled out in this way, and the claims of many other species singularly overlooked.

Regarded from several points of view, however, the Turtle Dove is a most interesting species, and the young naturalist would do well to become on intimate terms of acquaintance with it if he is desirous of studying one of the most welcome harbingers of our English Summer.

#### Order IX.—GALLINÆ, OR GAME-BIRDS

**Pheasant.**—We here reach a very important Order of birds, dearly beloved by the sportsman, and the handsome Pheasant occupies pride of place among them. At the present time these birds are mostly reared artificially, and it is reasonable to suppose that if Pheasant rearing and shooting were done away with the wild bird would dwindle down to a mere remnant, and in course of time probably become exterminated. The bird was originally introduced to our country by the Romans, but many other species and varieties have been added from time to time, until to-day it is often a very difficult matter to definitely identify a bird and assign it to any given species. The male bird is remarkably handsome, and when his love impulse in the Spring tempts him to engage in combat with a rival he is seen at his best. When his long tail is spread out fan-like he is a perfect feathered marvel, the general colours of red, brown, purple, green, yellow, and black showing up to great advantage. The scarlet sides of the head are bare of feathers, with small black spots. This is a meagre description of a really lovely bird, but a lengthy one does not come within the scope of the present work. The female may at once be distinguished from the male by her brownish-yellow plumage, the absence of the rich colours of the cock bird, and the posses-

sion of feathers on the sides of the head. Length, including the long tail, 36 inches.

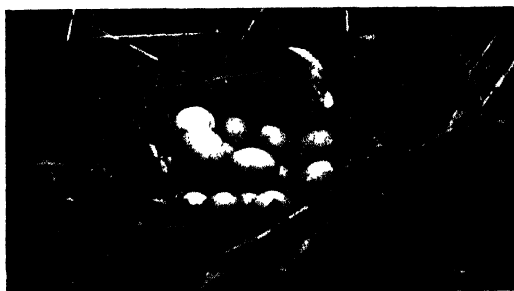
This bird, unlike the Partridge, does not pair; several females often lay in the same nest. From twelve to twenty eggs may be given as the average, but I have seen a nest containing as many as forty-eight eggs! These were probably the product of at least five females. Keepers go their rounds in the Spring and early Summer, and pick up the eggs of Pheasants for the purpose of placing them in nesting-boxes, to be hatched by fowls. This, of course, applies where game-rearing is carried out; where no game is reared the eggs are left to be incubated by the wild hen birds. Even in this case nests are often made up, some eggs being taken from a large clutch and added to a small one, and so on. The eggs vary a good deal in colour owing to the different species and varieties that have interbred, and the artificial conditions under which hen birds are penned and fed. The typical colour of the egg of the wild bird is pale olive-brown. The nest, if such it can be called, is placed in a hedge-bank, a copse, a wood, or a field. Leaves are generally used, with perhaps dry grasses. When placed in a wood in early Spring among the dead leaves of the past Autumn, the colour protection of the eggs and the sitting bird are both very marked, and one may almost step upon the eggs or the bird without seeing either. The protective coloration is most prominent in the sitting hen bird. She is most difficult to detect, and should be seen sitting upon her treasures to enable the observer to realise the wonderful example that is here presented of this remarkable law of protective coloration which is to be noticed in the world of animal life. The food in a wild state consists of berries, acorns, seeds, shoots, leaves, and insects.

The alarm cry of the cock bird is loud and startling, and has been compared to the words, "cock-up, cock-up, cock-up!" The bird rises hurriedly and in a flurried manner, and is calculated to make the least timorous naturalist somewhat perturbed when it gets up almost from beneath one's feet. It is interesting to notice that the young Pheasants can run about immediately they leave the shells, and that eggs of this bird,

the Partridge, the French Partridge, and even the Wild Duck, have all been found in the same nest.

The Fox is a great enemy of the Pheasant, and in a game district the keeper has to have all his wits about him to rear his precious charges. The wild sitting hens are snatched off their nests by Reynard, and when the young birds are placed in a wood in July he carries out fearful havoc among them—so much so that I have myself known of over thirty birds being killed in a quarter of an hour, the heads of the fowls in the coops being bitten off by this sagacious and bloodthirsty Mammal. Reference has already been made to this matter in my essay upon the Fox, to which I cordially direct the reader's attention.

**Red-Legged Partridge.**—This bird, also known as the French Partridge, was introduced into England in the reign of Charles II. It did not thrive very well, however; but on being re-introduced about 100 years ago, it soon made itself at home, and there are few districts known to me to-day where it cannot be found. It is disliked by sportsmen and gamekeepers, as it does not afford the same amount of sport as our own Partridge. It is a wild bird, wanders about a good deal, squats or runs along the ground, and does not rise in a covey, like our own British species. It is a very curious bird, too, in regard to its nesting habits. It will build its own nest, lay several eggs, and then go right away. In the meantime, I have known it lay some more eggs in the nest of the Common Partridge or the Pheasant, and then, after an interval of a week or a fortnight, go back to its own nest, lay some more eggs, and then incubate them! It places its nest in curious positions. A hedge-bottom is a favourite site, but I have seen it built on a straw-stack and on top of a barn. The eggs are much larger than those of the British bird, and quite distinct. They are cream or yellowish in ground colour, profusely spotted, freckled, and blotched, or either, with reddish or cinnamon brown. From twelve to eighteen eggs are laid, and gamekeepers often destroy them rather than permit them to be hatched. The nest is made up of dead leaves, grasses, and similar materials. The food consists of insects, grain, grass,



NEST AND EGGS OF PHEASANT

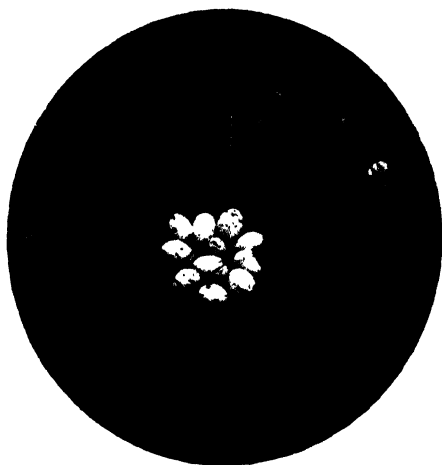


NEST AND EGGS OF FRENCH PARTRIDGE



NEST AND EGGS OF COMMON PARTRIDGE

*PLATE XLIX*



NEST AND EGGS OF CORNUCAKE



NEST AND EGGS OF MOORHAT

weeds, clover, etc. The vocal powers are not of a high order, and can best be described as a musical, piping cry.

Although generally disliked by sportsmen and keepers in view of its wandering habits, quarrelsome disposition, and general unsuitability as affording good sport, this is a beautiful bird, and deserves close examination. It also seems to keep up its numbers remarkably well, in spite of little, if any, encouragement. The cheeks and throat are white, encircled with black; there are spots and lines of the latter on the breast and sides of the neck, as well as a little white; reddish-ash above; flanks marked with crescent-shaped spots; rust-red near the tail; black on centre, bordered with white; bright red orbits, beak, and feet. Length,  $13\frac{1}{2}$  inches.

**Common Partridge.**—It is remarkable to notice that this well-known game-bird is regarded from a far different standpoint to its French cousin last described. Probably no bird included in the Order affords so much genuine sport to those who are fond of shouldering a gun. It is a typical British bird. It is not reared artificially, like the Pheasant; it is not a wanderer, like the French species. Even if not strictly preserved, the species would undoubtedly hold its own for many years to come. The great charm about the bird from the sportsman's point of view is that in the Autumn the brood of the year go about, unlike parent birds, in little companies called coveys. Sometimes a stray bird or two from another covey mix with their fellows, but, generally speaking, until the coveys are broken up and dismantled by continuous shooting, the coveys keep pretty much together. It is then the young birds of the year who, accompanied by their parents, form the covey, and, unless shot at, will keep together until well into November. This habit enables keepers and others to ascertain during early Autumn how the birds have bred during a past season, and what the prospects are for shooting purposes. When shooting has taken place, a few stray birds will mix with another covey, or it may be joined by some barren birds, but this is the exception rather than the rule. When rising the Common Partridges fly up almost in a body, but the old birds get up first and lead the way. The French or Red-Legged birds, it should be

noted, do not fly up all together. Some of them skulk, some run along the ground with much fleetness of foot, and some will permit one to walk on top of them before rising. It can thus be seen that for sporting purposes the bird is of little service.

The Common Partridge builds its nest under a hedge or bush, at the base of a stack, in fields, in woods, and other places. Little attempt is made at nest-building, a few dry grasses, dead leaves, and similar herbage being utilised. The eggs vary from six to twenty, but I have known one hen bird to successfully bring off twenty-nine young ones. This, however, was a made-up nest. In colour the eggs are pale olive-brown, but another common variety is bluish-green, similar to a variety of the Pheasant.

Insects, grain, leaves, shoots, weeds, and buds go to make up the food, and the young are very fond of caterpillars and the larvæ of the Ant. The love-call is a harsh, guttural, complaining note, and is often to be heard of an evening. Many people to whom I have pointed it out have expressed surprise when told the name of the bird responsible for such an utterance. The plumage is grey and reddish-brown; the male is to be identified by the horseshoe patch of chestnut situate upon the lower part of the breast. Length,  $12\frac{1}{2}$  inches.

Until this bird commences to sit the eggs are covered over with leaves and other materials. This habit results in the eggs being well concealed, and thus protected.

**Red Grouse.**—It will interest the reader to know that this is the only species of bird inhabiting our country that is not found in any other part of the world. It is an interesting story as to how we became possessed of this bird, and for a full description of it I would refer the reader to Dr. Scharff's "History of the European Fauna," or to the sketch of this bird in my book, "British Bird Life." Unlike the Black Grouse and the Capercaillie, this Grouse is monogamous and not polygamous. This means that it only has one partner, and not several. The Pheasant is a polygamous bird; the Partridge is monogamous. This is a beautiful game-bird, and I have spent many pleasant hours watching it, both in England

and Scotland. It is not known in the south of our island, but on the Lancashire and Yorkshire moors it is a typical part of the wild sights and sounds there found. I have observed the bird across the Yorkshire moors in Summer and also early Autumn, and remember on one occasion being across a wide expanse of purple-tipped heather on the eve of the much-looked-for August 12. It is a splendid sporting bird, and very good eating. When one considers the healthy conditions under which it lives on wide, healthy moorlands, and that it feeds upon the shoots of heather and heath, berries, moorland plants, and perhaps grain when it can get it, the reason its flesh commends itself is not far to seek.

In many ways this is a most interesting species. Take the moulting period. The male and female change their plumage at different times. The first-named moults in Autumn and Winter; the female in Summer and Autumn. Other members of the same genus undergo three moults, the Winter plumage being white in both male and female. The general plumage is reddish-brown on head and neck; chestnut-brown, barred and specked with black. above; almost black breast, tipped with white. In Summer the coloration is lighter, whilst in Winter a mottling of white is observable on the under parts. Length, 16 inches.

Both birds are much attached to one another, and in the pairing season the male is a lovable and constant companion. Not only does he undergo a series of courtship movements of great interest, and displays his dress to the best advantage, but he also gives vent to his feelings by uttering a series of powerful, ringing notes. It is indeed a most passionate and demonstrative wooer. The alarm note is "cock, cock, cock"; the call is a harsh "go-bac, go-bac-bac-bac"; whilst the female utters a peculiar nasal note likened to "yow, yow, yow."

If a nest is built, the materials used are heath, grass, or fern, with perhaps a few feathers. It is usually placed in a slight depression under a tuft of herbage or similar place of concealment. About eight or nine eggs are laid—sometimes more, at others, less—and these vary in colour. A typical variety is of a yellowish shade; another is bloodstain-red, blotched and



mottled with rich umber brown, and the paler one with various shades of light brown. The dark-coloured variety is a very handsome egg, and is to be numbered among the most beautiful laid by any British bird.

We have had to omit mention of several birds included in this Order, such as the Quail, Ptarmigan, Black Grouse, and Capercaillie, but these are either confined to the northern parts of our island or are such that they are not likely to come under the notice of the young naturalist. We may thus pass on to the next Order upon our list, and although it only contains three common species, two of them at any rate will be well known by sight; and the third one—the Corncrake—thrusts itself upon the attention by reason of its curious and continuous cry.

#### Order X.—FULICARIÆ

**Corncrake.**—This bird is a late Summer visitor to our shores, arriving towards the end of April. It at once heralds its arrival by uttering a harsh note which, once heard, is not readily forgotten. It may be written down phonetically as “kray, kray, kray,” but is usually given as “crex, crex, crex.” It is really not a monotonous sound; indeed there is a rural simplicity about it that appeals to the true lover of wild life. The note is more remarkable because of the ventriloquial effect as it now sounds quite close at hand, now far away. This is caused by the bird running along, and turning its head from side to side as it proceeds. It is very fleet of foot, resorts to grass and corn fields, and contrives to hide itself in a very clever way. It rarely takes to flight, and when a hayfield is being cut will remain until the last portion is reached before attempting escape. This seems an extraordinary habit for a bird of passage, and one wonders how it is that a species resorting to protracted wanderings over sea and land should be able to carry out any prolonged flight. By rubbing two stones together it is quite easy to call this bird almost to one’s feet, and the note may also be imitated by passing the fingers over a fine-toothed comb.

The Corncrake—or Landrail, as it is quite as often called—

is a useful bird, feeding upon slugs, snails, worms, leeches, beetles, weed seeds, and various kinds of herbage.

The nest is placed in fields and meadows, and usually in a slight depression. It is composed of dry grass and leaves, lined with finer portions of the first-named. The eggs generally number from seven to ten, but I have found as many as fourteen. These are reddish-white, blotched or spotted with reddish-brown and ash-grey. In some districts this is a very common bird, in others it is singularly uncommon. In Ayrshire I have found it extremely numerous, but in Hertfordshire it is a very local species. One or two pairs frequent the same district year after year, whereas in Scotland I have heard a number of birds during an evening's walk. In size it is hardly as large as a Partridge, and not nearly such a plump bird. It is yellowish-brown with darker markings on the upper parts; ash-grey over eyes and on the cheeks; throat, white; breast, greyish-buff; belly, white near the centre. Length, 11 inches. The egg is large in comparison to the size of the bird, and the young can run about almost as soon as they emerge from the shell.

**Moorhen.**—This is a common species inhabiting our rivers, streams, lakes, and ponds. It is at once distinguished from the Coot by having red on the forehead instead of white. It is dark olive-brown on the upper parts; slate-grey head, neck, and underneath, with white streaks on the flanks; under tail-coverts white; greenish-yellow legs, red above the tarsal joint; bill yellow in front, red at base. The male is about 13 inches in length, but the female, contrary to general rule, is larger and brighter coloured. The rush nest is a shallow structure, and is often found practically floating on the water. To provide against floods and a rise in the water, the nest is built very frequently on a kind of raised platform, and then assumes bulky proportions. It is usually placed among aquatic herbage of some kind; but this last few years I have seen quite a number built in bushes and trees. A limb of a tree overhanging the water appears to be a very favourite site. The seven to twelve eggs are reddish-white, blotched or spotted with orange-brown. Some varieties resemble those of the Corn-

crake, but are larger. On the other hand, they are very much smaller than those of the Coot, and of quite a different character. As soon as the young are hatched, they are capable of taking to the water straight away, often with the shells still adhering to them. They are mere sooty balls of black down, but swim with grace and facility. It is a most engaging sight to witness a brood hatch, and take to the water without the slightest hesitation. One cannot but admire the courage and pluck possessed by the young fledgelings, and be interested in the habits of the old birds as they lead the young ones through the water with immense pride. I photographed a nest of this bird on one occasion containing seven eggs, and from the time I started to rig up my camera to the time I secured the photo, five of the eggs hatched before my eyes, and the young ones at once jumped into the water! The food consists of insects, slugs, snails, worms, and various vegetable matter. On occasions I have met with this bird feeding in fields some distance from its natural habitat. The note is a kind of "crr-o-ok" repeated occasionally, a pleasant sound well known to anglers and boating-men. The bird is often called the Water Hen.

**Coot.**—A much larger bird than the last-named. The Coot is slate-grey on the upper parts, with a thin bar of white across the wing; sooty-black on under parts; a prominent patch of white on forehead; dark-green legs and feet. Length, 18 inches.

The haunts of this bird are very similar to those of the Moorhen. The nest and materials used also closely resemble those of the latter species. The eggs number from seven to twelve or fourteen, and are dingy stone-colour, spotted and speckled with minute markings of dark brown.

Small fish, worms, and the tender portions of aquatic plants go to make up the dietary. The note is clear-sounding and frequently uttered. It has been compared to the words "k-ō," "crew," or "kew."

Several curious old-fashioned names have been accorded, such as Bald Coot, Belpoot, Beltie, and Bald-Headed Coot. In some districts this is quite a common species, and I have

counted as many as fifty upon the water at one time. I have the pleasantest recollections of this bird, the Moorhen, and the Little Grebe, they having been my constant companions upon my angling excursions in my younger days.

#### Order XI.—LIMICOLÆ

**Golden Plover.**—This beautiful Plover, the first representative of a delightful family of birds, is only known in the South of England as a Winter visitor. In my own county of Hertfordshire I invariably see large flocks of these birds during the Winter months, and it is a curious fact that they nearly always resort to the same fields year after year. I have counted one flock of at least 500 of these birds, and the effect as they rise in the air and sail round, uttering in concert together a by no means unmusical note, is a very pleasant one. It is a far different cry to the note of the Lapwing, and in the breeding season a shrill, musical utterance is emitted which runs off into a sort of trill.

This is an inhabitant of moors and wild places during the nesting season. Little attempt is made at nest-building, a little heath or grass being used when a nest is constructed. The four eggs are often laid on the bare ground, and are a warm stone colour, prominently spotted and blotched with very dark or blackish-brown.

Snails, slugs, worms, insects, and various herbage go to make up the food, and the bird has long been highly regarded as a delicacy for the table. The Summer and Winter plumage are totally distinct. In Summer the under parts are intense black. After the Autumn moult this is replaced with pure white. The upper parts are greyish-black, spotted with gamboge-yellow; a line of white runs above the eye, and down the neck until it reaches the flanks. The rich golden spots that decorate the upper parts account for the first part of the English name. These have a beautiful effect when seen on the greyish-black ground colour. In the Winter this golden is more pronounced than in Summer. Length, 11 inches.

**Ringed Plover.**—This is one of the cheeriest and most active birds found by the seashore, and on salt marshes and

rivers in the neighbourhood of the sea. The bird cannot fail to attract attention by reason of its plaintive alarm-note, winning ways, and plumage. It has a black forehead, lores, and gorget; a white band across the forehead, as well as the same colour over the eye, and on the collar and lower parts; light-brown upper parts, orange bill and feet. The female does not possess such a black collar. Length,  $7\frac{3}{4}$  inches.

The four pointed eggs are laid among shingle or sand, and are most difficult to locate. I have seen several "nests" of this bird—real and so-called—but in some instances good attempts have been made at constructing a homestead. I have in my collections a series of photographs taken by my friend Dr. Kelso, of Southsea, showing interesting examples of the evolution in nest-building carried out by this dapper little Plover. First we have the four eggs laid among shingle, no attempt whatever being made to build or ornament the nest. Then the eggs upon sand, with a few pieces of broken shells and stones. The next shows us the eggs among shingle, with a few pieces of grass and straw, and so on, through the series, until we get a fairly complete nest built among herbage.

The eggs are cream-coloured, streaked and spotted with black, and do not appear to vary to any extent. It is extremely difficult to sight them when laid among shingle, and the young birds, too, have a plumage that is so broken up, that when they squat, or even run, it needs a practised eye to either locate or follow them. All the birds belonging to this Order produce eggs which taper very acutely at one end, from the small egg of the present species to the large pear-like shell of the Curlew. I find, however, that the egg of the Oyster-Catcher is not so characteristic in this way as those laid by its near relatives.

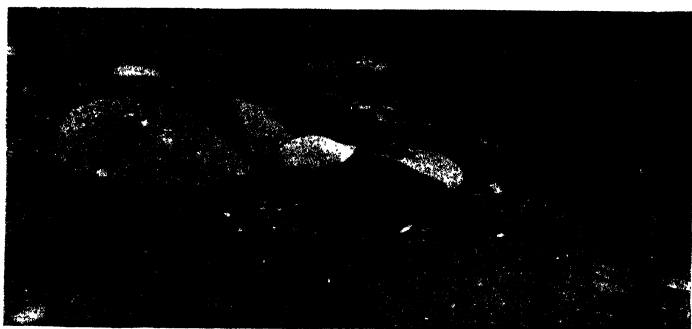
The Ringed Plover feeds upon marine insects, worms, shrimps, and various refuse. It runs about in an active, engaging manner, dabbles among mud on the banks of rivers and streams, and at the fringe of the sea, for food, and one never tires of watching a company of them, so vastly interesting and full of animation they appear. Many very curious names have been accorded this bird, such as Dull Willy, Wideawake, Sand Lark, Sandy Loo, Shell Turner, and Stone



PARENT BIRD SETTLING DOWN ON EGGS



SIDE VIEW OF BIRD ON EGS



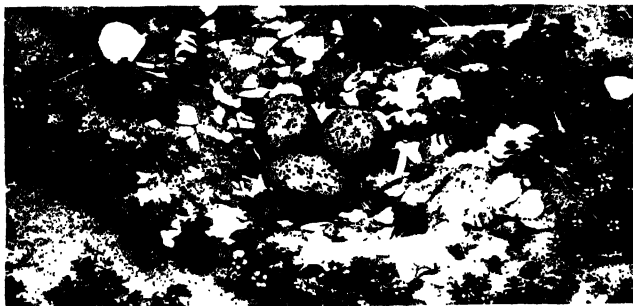
BACK VIEW OF BIRD ON NEST

THREE STUDIES OF THE RINGED PLOVER

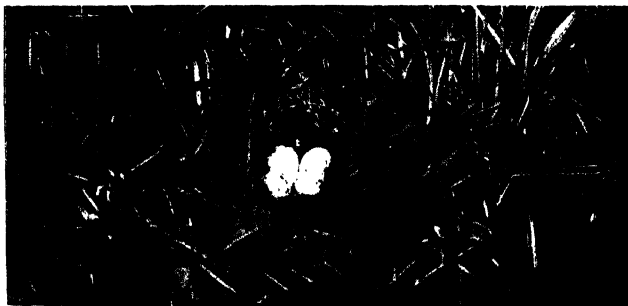
*PLATE LI*



NEST AND EGGS OF LAPWING



NEST AND EGGS OF OYSTERCATCHER



NEST AND EGGS OF COMMON SANDPIPER

**Runner.** It should be mentioned that the adult birds are also protectively coloured, and on the wide stretches of sand at Filey, in Yorkshire, I have only been able to locate quite a number of birds by the aid of my glasses, although they were close at hand.

**Lapwing.**—This is a much better known bird than the two species last under review, and there are few districts where a pair or more of these birds are not found, whilst in Winter-time large flocks move about the country in well-regulated movements. The birds cling to the same nesting-haunts year after year, so much so that several fields known to me since boyhood have come to be known as "Plover-fields." The same remarks apply to the flocks in Winter, for those who use their eyes intelligently in the country may almost always locate some of these birds in certain spots.

My observations lead me to conclude that this bird does not care for poor, untilled land. It follows the husbandman wherever he tills the soil, and in rich agricultural district finds a congenial home. Here the Lapwing, or Green Plover, as he is often called, does an amount of good feeding upon various insects, earthworms, slugs, etc. It is to be regarded as one of the farmer's best friends, and those who are unwise enough to encourage the collecting of its eggs in Spring often have to pay dearly for it. No sportsman worthy of the name would raise his gun against such a highly beneficial species, whilst to the general lover of our wild birds there is a wild charm in watching and listening to it perhaps unsurpassed in our home counties by any other bird on the British list. The weird cry; the extraordinary wheeling, turning, twisting, swooping, circling, and falling upon the wing; the beautiful plumage of green and snowy white; engaging habits when upon the ground; useful life—such are a few of the salient features of this bird. It is an early breeder, and a zealous hunt is carried out to secure the first eggs for the London market in March. A poor apology for a nest is made, a mere depression or rut usually being requisitioned. If materials are used they consist of bents, a few straws, dry grasses, and perhaps a little moss. The four olive-green eggs are blotched



or mottled with black or blackish-brown, and do not exhibit much variety. The name of Lapwing has been given because of the movements of the wide wings, whilst the bird is also known as the Peewit by reason of its two plaintive notes. Closely examined, it is a beautiful bird. The crown and crest are greenish-black; metallic green reflected with purple on upper parts; throat and upper breast, bluish-black; belly, white. Length, 12 inches. The young, as are those of all the Plover family, are most interesting and engaging chicks. They can run about soon after being born, and contrive to hide and squat so as to escape detection in a very wonderful way.

**Oyster-Catcher.**—Those who visit the seashore, where various sea-birds frequent, cannot fail to notice this conspicuous species, both by reason of its striking plumage and clamorous cry. It is jet black and pure white in colour, has a prominent orange-yellow bill, and purplish-pink legs and feet. Length, 16 inches. This is one of the chief sentinels of the shore, and, when an intruder appears, the bird utters a clarion cry to warn its fellows that danger threatens. It is a shrill, piercing note, and is sure to arrest attention. The bird runs about and struts in an active manner, and is at all times well worth watching. The nest—if such it can be called—is merely a slight hollow, with perhaps a few small stones or fragments of shells, and is placed on rough shingle or rocks. One I saw was a very beautiful sight, the eggs being placed among some pink thrift in full blossom. The three or four eggs are a pale stone-colour, or yellowish, spotted and streaked with rich dark brown and ash-grey; sometimes blackish and dark grey.

Although called the Oyster-Catcher, the bird, so far as I know, does not feed on oysters, but certainly does partake of some kinds of shellfish, also sea-worms, shrimps, and other marine creatures. It is known by many local names, one that is very appropriate being that of Sea Magpie.

**Dunlin.**—We here make the acquaintance of a small member of the Sandpiper family. Although it nests in our island, there is a large immigration in Autumn and Winter, and the bird becomes much more prominent at such times. When a company of these birds are seen on the wing the effect is

very pleasing, as they sweep along showing alternately the upper and under surface. It inhabits fens and moors, inland lakes, sand-banks, and the seashore. It mostly resorts to the first-named as a breeding-haunt, the nest being placed in a hollow of the ground, but generally concealed by grass, heather, or similar herbage. A few pieces of stick, bents, roots, dry grass, or moss are utilised. The four greenish-white eggs are blotched and spotted with reddish-brown, and taper to a point at one end, as all the eggs of this family of birds do. Marine creatures of various kinds constitute the food. In the Spring the male utters a pleasing trill, but at other times the note is grating and harsh.

The crown is rufous, streaked with black; mantle chestnut, variegated with black; remaining upper parts grey; throat and upper portion of breast, greyish-white and striped; lower breast, black; belly, white. This is the Summer plumage. The Winter plumage is mostly grey above and white below, banded with grey on the lower breast. The female is larger than the male, measuring 8 inches in length.

**Common Sandpiper.**—This is a Summer visitor only, arriving about mid-April from Africa, where it spends the Winter. Like its relatives, it is an active, engaging species, and is bound to attract notice. It flirts its tail in a pleasing way, runs in a most captivating manner, and utters persistently a clear, musical note. In the Spring the male hovers, and utters a trilling kind of song. When I was fishing at a loch in Scotland, I was far more entertained by a number of these birds than by the fish I unsuccessfully endeavoured to catch. The whole day long the notes of the birds were to be heard, and as I sat there enjoying the pure, invigorating air far across the hills, out of sight of any human habitation, these birds, a few Meadow Pipits and Wheatears, were my sole companions.

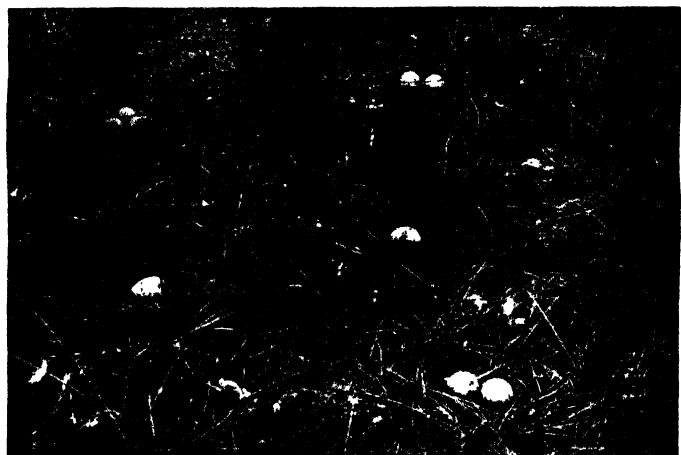
I have met with the Sandpiper in many different places. I have located it on a small stream, a large river, a moor, a lake, by the seashore, along a ditch-side, and elsewhere. It appears much more common in some districts than others, and where it is found is usually fairly abundant and a regular visitor. I was most happy when one morning early I observed one of these

favourite birds on the borders of a sheet of water in my own county. The bird does not nest with us; indeed, I should be surprised to learn that it stayed the Summer anywhere in Hertfordshire, and the specimen I saw was apparently halting during migration movements. It is the only occasion on which I have ever noticed it in the county named. It is unexpected occurrences such as this that help to make the study of birds so interesting and engrossing. In Scotland, Yorkshire, Sussex, and Norfolk I have met with the bird very frequently. Hardly any attempt is made at nest-building. When any materials are used they generally consist of moss, sedge, or dried grass. A slight depression in the soil by some water, among a tuft of herbage, and in turnip and corn fields—such are a few of the nesting-sites chosen. The four yellowish-white eggs are blotched and spotted with ordinary or deep brown. The food consists of insects, worms, small fry, and crustacea. In Scotland the boys across the hills always spoke to me of the bird as the Sandy Lavrock. Another curious name is that of Willy Wicket. The upper parts are ash-brown, glossed with olive; white chin; pale ash on sides of neck; breast streaked with dusky white below. Length, 8 inches.

**Redshank.**—A marsh, fen, tidal flat, salting near the sea, the seashore, an inland lake or river—such are some of the haunts of this long-legged bird. It is another sentinel like the Oyster-Catcher, and shore-shooters and wild-fowls do not take kindly to its clarion cry, as it warns other feathered folk to be on the alert. It is a clear, loud-ringing cry. It is not a common bird by any means, and haunts that it once used to frequent know it no more. Perhaps the most interesting sight is to see a company of Redshanks waiting patiently upon the shore for the tide to recede, and expose some of their favourite feeding-ground. Once the tide has gone out, the little gathering disbands, and away the birds go and busily employ themselves, feeding upon various insects, marine worms, small crustaceans, etc. The flight is deliberate and slow, but in the nesting season the bird gives vent to its feelings in no half-hearted manner, and dashes and tumbles about in a most bewildering way. If one approaches near the breeding-ground, it will, like



NEST AND EGGS OF REDSHANK



NESTS AND EGGS OF SANDWICH TERN



others claiming kinship with it, feign wounded by fluttering over and along the ground, and endeavouring to lure the intruder away from where its eggs or young are secreted. The nest is placed in a clump of grass or other herbage on exposed saltings or marshy commons. It is usually well hidden, and I have seen its nest concealed among rushes in a very ingenious way, so much so that unless the bird had been flushed the nest would never have been found. Dry grass, heather, and moss are used, but the surrounding herbage is trodden down very often, and thus serves the purpose of a nest. The two to four eggs are cream-coloured, speckled, and spotted with dark brown. It is a larger egg than either that of the Dunlin or Sandpiper. In Summer the upper parts are pale brown, streaked and barred with umber; white rump, flecked with dusky; white tail-feathers, barred with blackish; white under parts, streaked with umber on neck and breast; orange-red legs and feet. In Winter the upper parts are ash-coloured; rump and under parts white, slightly spotted, and streaked with grey on breast and neck. Length, 11 inches.

**Curlew.**—Whilst the members of the Sandpiper family have long straight beaks with which they probe about in the mud and ooze by the sea and river, the Curlew has a long curved appendage that at once distinguishes him from the last-named. The Curlew is in Spring and Summer a typical bird of the wild extensive moorland, and there he must be sought. In Winter, however, the moors are forsaken, and he comes down to the seashore, or its near vicinity, until the following Spring. When bird-watching over some extensive moor very sparsely populated by animal folk of any kind, save, perhaps, the inevitable Rabbits, a few Adders and Lizards, Insects, and such birds as Wheatears, Meadow Pipits, Ring Ouzels, Grouse, and, as one reaches a burn, gully, or ravine, some Wagtails, Dippers, or Sandpipers, it is really most welcome to make acquaintance with any bird or other inhabitant of the fairyland of animal life. The surroundings are so quiet, so extensive, so weird, so inexpressibly awe-striking, and yet inspiring, that the sudden note of even a common bird, or the sight of the white bobbed tail of a frightened Rabbit as it scurries into a hole, of a little

Lizard sitting sunning himself on a bare patch of ground, or even a Tiger Beetle scuttling over the sandy soil—little sights and sounds that in the woodland or rich meadows and lanes would hardly attract attention, much less enthuse one—are very welcome. And if one is fortunate to come across the Curlew in his wild fastness high up on the moors, far from the madding crowd, it is pleasing indeed. He is very suited to such an environment: wild is his music, weird is his home. A typical moorland bird, the very mention of his name in Summer-time reminds one of days spent tramping over heather-clad moors in the broiling sun—red-letter days in the naturalist's wanderings.

You must be wonderfully patient, however, to see the home-life of the Curlew, for it is a wary creature, very alert, cunning, and vigilant. Like the Jay of the woodland, and the Oyster-Catcher and the Redshank of the seashore, the Curlew is the sentinel of the moors. The note somewhat resembles the bird's name, and may thus be written: Call, a shrill "curlee," or "cur-l-ooë." When flying it utters a harsh "tutuo." The nest is usually placed among a tuft of grass, rushes, or heather, and is composed of dry grass, heather twigs, rush or sedge-leaves, and similar materials. The four large pear-shaped eggs are pale greenish-dun, varying to olive-green, spotted with darker shades of green and dark brown.

In many parts of the country the bird is known as the Whaup. The food upon the moors is made up of various insects, worms, and probably tender shoots of moorland plants, whilst in Winter the diet is changed to crabs, marine insects and worms.

A large bird of 21 to 26 inches in length, the plumage is not of a brilliant description. It is reddish-ash generally, mottled with spots of a dusky colour; whitish on belly, streaked with dusky; white rump. The female is larger than the male.

#### Order XII.—GAVIÆ

**Arctic Tern.**—This is a very important Order of birds, including as it does the Terns, the Gulls, and the Skuas. We shall make the acquaintance of three of the commoner members

of the Tern family, and several of the Gulls. The two Skuas are uncommon birds, and resort to the Far North; these, therefore, will not come under survey. The Terns are distinguished by their sharp, clean-cut wings, remarkably beautiful flight (likened to the better-known Swallow), graceful habits, and general symmetrical form and delicate coloration.

The Arctic Tern nests in the North of our island, and is also very plentiful in Ireland. It breeds in colonies, and the young ornithologist would do well to visit one of these during the nesting season. He will never forget the wonderful sight that is presented, and can spend many hours watching the aerial evolutions of these delightful creatures. The present species is, perhaps, the most engaging and graceful of its family. It hovers in the air like a Humming Bird, then resorts to buoyant movements of a most varied description, and is a splendid fisherman. The birds can be watched at close quarters if they realise that no harm will befall them, and I know of no other sight in the whole realm of bird-life so captivating and enjoyable. The plumage and form of this bird do much to attract attention. The head and nape are black; mantle, pearl-grey; rump and tail, white; under parts, pale pearl-grey; bill, blood-red; legs and feet, coral-red. Length,  $14\frac{1}{2}$  inches.

The eggs are laid among sand, gravel, or shingle. Little attempt, if any, is made to build a nest; when this does happen, small pieces of seaweed and a few dry grasses are used. The two or three eggs are either buff, olive, greyish-brown, or stone in ground colour, blotched and spotted with blackish-brown and grey. The egg varies a good deal in colour and markings. Small fish constitute the food of all the Terns. The note of this species is a powerful scream.

**Common Tern.**—This Tern resorts to the neighbourhood of the sea and seashore, like its relative last described, as well as inland waters. The general plumage and size are the same almost as in the Arctic Tern, but the bill, legs, and feet are orange-red, and there is some white on the underneath parts. The two or three eggs are very similar to those of the bird last under review; the note also bears a great resemblance.

The Common Tern is found inhabiting more southerly parts



of England than the Arctic species, and is a better-known bird, as its many local names display. A few of these may be given: Gull Teaser, Rippock, Scobby Scraye, Sea Swallow, Tarney, White Daw, and Big Mow.

**Sandwich Tern.**—This, again, is a Northerly species, nesting in Scotland and Ireland. It is not such a graceful bird upon the wing, the flight being more laboured and less buoyant. The note is harsh and grating. The nesting habits, food, number and colour of the eggs, are all very similar to the Common Tern, and need not be detailed. This is our largest British Tern, measuring 16 inches in length. The top portion of the head is black, as also the bill and feet; mantle, pearl-grey; rump, tail, throat, and under parts, white; breast, tinted with rose colour.

The Lesser, or Little, Tern, and the beautiful Roseate Tern, complete the five species, which we may justly claim as British breeding birds; but both are rare, and unlikely to come under the notice of the young naturalist.

**Kittiwake Gull.**—This pretty little Gull—the smallest upon the British list which nests among us—has acquired the first part of its English name by reason of its three notes. Two of these are rapidly emitted, but the third is longer drawn out. A more charming sight than a company of these sea-birds sitting in a rocky situation is difficult to imagine. It is on the ledges of precipitous rocky sea-cliffs that the nest is made. This consists of marine plants lined with dry grass. The Kittiwake breeds late in the season, and young may be found in the nest in July. It is then that they suffer a good deal from the ravages of shore-shooters, who find pleasure in practising this so-called form of “sport.” The three eggs are stone-coloured, olive-tinged, or bluish in ground colour, blotched and spotted with ash-grey and two or three shades of brown, chestnut to umber.

This Gull feeds exclusively upon small fish. The head, neck, tail, and under parts are white; deep grey mantle; bill, greenish-yellow; legs and feet, black. Length, 15½ inches.

**Herring Gull.**—This is one of our largest Gulls, and is so called because of its partiality for Herrings. The food, how-

ever, is not restricted to fish, for the bird partakes of various marine creatures, dead and alive, as well as insects, worms, and garbage. When the Herring shoals are migrating it has fine sport, and the fishermen, seeing the birds out at sea busy feeding, have good warning that it is time for them to commence fishing operations. That it does some amount of harm is obvious, more especially in rivers containing Salmon, for Sir Herbert Maxwell has told me that when the Salmon smolts are descending the rivers in early Summer the Herring Gull commits much damage among them.

This is quite a common Gull, and there are few parts of our coast where it cannot be located, although not as a breeding species. It haunts piers, harbours, houses near the sea, and back-waters, and becomes very tame and confiding if unmolested.

Rock-ledges and grassy situations by cliff-sides are the favourite nesting haunts, and here it congregates in considerable numbers. The structure is composed of grass and seaweed. Three eggs are laid, and these vary a good deal. Various shades of brown, pale or light olive-green, or warm stone in ground colour, spotted and blotched with some kind of brown, may be given as a general description. It is very difficult in the eggs of many kinds of sea-birds to lay down any hard-and-fast rule as to the exact coloration and markings.

I have spent many pleasant hours at the summit of Bempton and Speeton cliffs in Yorkshire watching these birds and listening to the weird alarm-cry of "ky-eok," which is repeated quickly several times. It is a fine bird upon the wing, and whether wheeling through the air, hovering, sailing buoyantly, sitting complacently upon a rock or shore, or fishing, it is equally interesting and entertaining. I prefer watching a company of Gulls standing upon a patch of sand or rock still uncovered by the incoming tide, and especially in early Autumn. At such a time one may see Gulls of various kinds mixing freely together and in almost all stages of plumage. It is fearfully difficult to pick them out, and one needs to be accompanied by a good shore ornithologist, preferably a taxidermist living in the district who is continually handling the birds, to learn very

much useful information about them. Much interesting data is elicited by the aid of a guide such as I have mentioned. I am only too willing to confess that when I visited the Yorkshire cliffs in the Autumn of 1907 I should never have identified a large number of young and immature Gulls if it had not been for the kindness of my good friend, Mr. W. J. Clarke, of Scarborough, whose knowledge of the sea-bird life of the Yorkshire coast is very extensive. It is a good plan for the young naturalist, when visiting a new district—especially at a seaside resort—to get to know a reliable local naturalist, for he will be able to show him in a few days' outings the chief faunal and floral features of the district, which it would take a stranger with a restricted holiday some time to explore on his own account. The Herring Gull has a grey mantle; white head, tail, and lower parts; legs and feet, flesh-coloured; bill, yellow. Length, 24 inches.

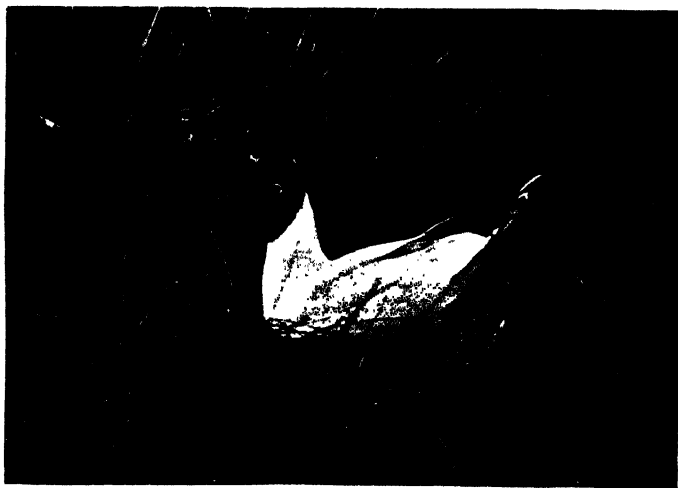
**Lesser Black-Backed Gull.**—This species, and the Great Black-Backed, are not nearly so plentiful as the Herring Gull. The Lesser Black-Back is about the same size as the last-named. The nest is composed of seaweed and grass, and is placed on the ground in some crevice or depression, or among herbage. The bird is gregarious, and will nest close to the species last under consideration. It is fond of an island in a lake, a remark that applies to several of the members of this family of birds. The two or three eggs are similar to those of the Gull last described, and are subject to the same variation in colour and marking. The note uttered is best described as laughter-like, and yet strikes one as weird and desolate, thoroughly in keeping with the bird's surroundings.

The Summer plumage of the mature bird is white with the exception of the mantle; this varies from slate-grey to black; the bill, legs, and feet are yellow. Length, 23 inches.

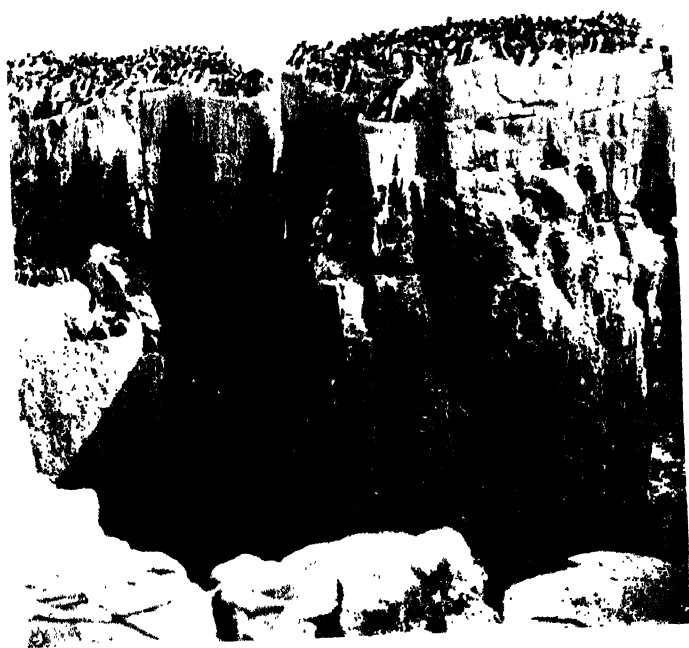
**Common Gull.**—Although named "Common" Gull, it seems to be generally agreed that the Black-Headed Gull is much the commonest Gull we have in this country. At the same time, the present species is *not* at all uncommon, and there are few spots near the sea on some low grassy island, in lochs, inland lakes, and deep bays, that are unfrequented by it. It is



BLACK-HEADED GULLS SETTLING



BLACK-HEADED GULL ON NEST



COMMON GUILLEMOTS ON ROCK

not such a cliff-loving bird as several of its relatives. The nest is built upon the ground, and is composed of seashore plants, seaweed, dry grass, heather, etc. It is usually of good size. The two or three eggs vary a great deal. Whilst some are light blue or straw in ground colour, others are green or brown. Some varieties are well blotched and spotted with dark brown and ash; others are well streaked with the brown, but only bear a few spots of the grey.

Like the Black-Headed Gull, this species follows the plough for insects, worms, and other food, and hunts over moors, marshes and pasture-lands for small vertebrates and carrion. The call-note may be likened to the word "yak," and a laughter-like "luka, luka, luka." The young Gulls are clothed in brown and white down, and are pretty little creatures until they commence to lose their downy covering and begin to put on the second dress. These young ones are often called Cuddy Moddys, whilst the immature bird is known as the Mew.

The head, neck, tail, and under parts are white; mantle, ash-grey; black wings patched with white; legs and feet, greenish-yellow. Length, 18½ inches.

**Great Black-Backed Gull.**—This is the largest Gull that nests with us, being 30 inches in length. The general plumage is the same as the Lesser Black-Backed, but whilst the bill is yellow, the legs and feet are flesh-coloured. As a nesting species it is mostly confined to the North of our island. It does, however, nest sparingly in England, Wales and Ireland. It is a typical sea-loving species, and may often be met with many miles from land. At the approach of the nesting season, however, it comes to land to breed, and not only this, for it traverses quite a distance inland, and I have found it nesting two miles from the sea. When it sojourns on the land during the breeding season it may be observed flying over the moors, or along the cliffs, intent upon robbing some other bird of its food, or of the eggs or young birds. It is a piratical bird, a big feathered robber. Being so formidable in size, it can act the part of plunderer very well. When out at sea, after the nesting season is at an end, it appears to feed upon dead animal

matter. Various positions are chosen as a nesting site, such as the top of a flat-topped rock or cliff, at the foot of a cliff, among herbage, etc. The large nest is built of seaweed, grasses, and perhaps a few feathers or wool. The three eggs are similar to those of the Herring Gull, but larger and more handsome. They also have larger masses of surface colouring upon them. The loud and frequent call resembles "ag-ag" and a yelping "kyank."

**Black-Headed Gull.**—This is the Gull most frequently seen upon the Thames and in the London Parks during Winter. At that season, however, the blackish-brown feathers upon the head are lost, and do not again appear until the following Spring. The bird is therefore often wrongly identified. This is a very common species. It is gregarious in its nesting habits, and enormous numbers congregate close together and build their nests on the moors, among rushes surrounding inland lakes, and upon islands. There are several famous breeding haunts of this bird in England, one of the best known being Scoulton Mere, in Norfolk. This is a much more typical inland Gull than any of its congeners.

It is a regular visitor to ploughed lands in the neighbourhood of the sea, and even those birds which do cling to the shore and the ocean appear to spend most of the day dabbling on ploughed fields and returning to the sea towards evening. There seems little doubt that this is one of our most useful Gulls, and to the farmer is an unspeakable blessing. It feeds on worms, grubs, insects, small vertebrate animals, and carrion. The white and grey plumage and the handsome, blackish-brown head, are well shown off by the dark soil when the bird is upon recently turned up earth, and I have often spent a pleasant time watching the birds on the agricultural belts of land on the Sussex Downs. I have never visited one of the most famous breeding haunts of this Gull, but I am told it is a most remarkable sight, and one not easily forgotten. If in Norfolk during the Spring or early Summer, the young bird-lover would do well to visit Scoulton Mere and see for himself the vast assembly of birds there gathered together. When it is stated that as many as 10,000 to 20,000 eggs have been

collected at Scoulton in one season, some idea may be obtained of the number of birds there located, especially as only three eggs are laid. These, like those of most Gulls, vary a great deal. Sometimes the ground colour is light yellow, or blue; at others, red, green, or brown. Some are thickly spotted or blotched, others have few markings upon them. The note is laughter-like, and hence the bird is sometimes called the Laughing Gull.

It has a number of local names such as Blackcap, Crocker, Hooded Maw, Mire Crow, Pickmire, Redlegs, Rickim-re, and Scoulton Gull, the latter being given to the bird because of its nesting at Scoulton Mere, as already recorded. The length of this Gull is 16 inches.

#### Order XIII.—TUBINARES

**Petrels.**—Four species of Petrels nest in the British Isles—namely, the Stormy, Fork-Tailed, Fulmar, and the Manx Shearwater. Unless sought after or cast up on the shore as a result of severe weather, it is unlikely that either of these will come under the notice of the young bird-hunter. They are, comparatively speaking, rare birds. They nest in the extreme North of Scotland, and when not nesting the Stormy Petrel especially is a typical oceanic bird. One egg only is laid by each species, and this is white. That of the Stormy Petrel is the smallest; that of the Fulmar Petrel is the largest. The egg is placed in the burrow of a Rabbit, under a stone, in the hole of a wall, or other similar site. Little attempt is made at nest-building, a sprinkling of herbage of various kinds being used. The food is made up of offal, blubber, meat, crustacea, and other marine creatures.

Largely nocturnal in their habits, these Petrels are difficult birds to study. Perhaps the little Stormy species is the most interesting of all, because it is the smallest web-footed bird known. It is a brave little bird, and may be met with in the roughest weather battling against the waves miles from land of any kind. It is this species that has for so long been known as Mother Carey's chicken. A description of the plumage of each bird may now be given.



**Stormy Petrel.**—Black, excepting at the base of the tail-coverts and the edges of the wing-coverts, which are white; black bill and feet. Length, 6 inches only.

**Fork-Tailed Petrel.**—Sooty-brown; upper tail-coverts white, some of under tail-coverts same colour; tail very forked, hence the forepart of the bird's name; brown irides; dusky-black bill, legs and feet. Length, about 7 inches.

**Fulmar Petrel.**—White on head, neck and under parts; grey legs, feet, mantle, and tail; dusky quills; yellow bill. Length, 19 to 20 inches.

**Manx Shearwater.**—Sooty-black crown, nape and upper parts; white underneath; greyish-brown mottlings on sides of neck; blackish bill; yellowish flesh-coloured legs and feet. Length, 15 inches.

The Petrels have acquired their English name because of the curious manner in which they tread, or paddle, upon the water. They are thus named after the apostle Peter. The name of Shearwater has been accorded to the fourth species by reason of its habit of gliding, or shearing, just above the crest of the waves.

#### Order XIV.—PYGODES

This is the last Order of birds upon our list, and contains a few very interesting and common species. Among them, it is important to point out, is the Razorbill, the nearest living relative of the now extinct Great Auk.

**Little Grebe.**—Whilst the handsome Great Crested Grebe is increasing its range in various parts of the country, it is more likely that the young student for whom this book has been written will come in contact with the Little species, which is very much commoner. On our streams, rivers, lakes, and ponds, this bird—called by such curious names as Dabchick, Tom Pudding, Arsfoot, Didapper, Dob Chicken, and Ducker—is sure to be located. You must keep your eyes well open, however, as the little rascal is very quick, alert, and artful. It dives with remarkable swiftness, and paddles under water with celerity. Having gone some distance, if a careful watch is kept, the head of the bird will be seen slowly rising out of the water. The Dabchick had come up to breathe. It is

vastly interesting to watch a number of them playing hide-and-seek in this way. I was fishing on one occasion, and the whole day long two or three hundred of these birds were busy feeding on and about the lake, much to my enjoyment. I put down my rod and went towards them, when, all at once, and without any warning, they all disappeared as if by magic! The water was very clear; it was a scorching hot Summer's day, and I could perceive the birds propelling their bodies through the water below, and the whole company presented a very curious, entertaining sight. The nest is composed of dead aquatic herbage, and is frequently found floating on the surface of the water. The eggs are sometimes covered over when the nest is left, but not invariably. These number four to six. When first laid they are white, but soon become soiled and considerably darkened. I have some in my collection almost black. The food consists of frogs and their tadpoles, fish, and various aquatic insects.

The notes uttered by this bird can best be compared to a stick drawn along a rail, and of the creaking of a rusty hinge on a gate. I hope the Little Grebe will not be offended! The head, neck, and upper parts are dark brown; under parts, greyish-white; cheeks, throat, and sides of neck, reddish-chestnut; bill, horn-coloured; legs and feet, dull green. Length,  $9\frac{1}{2}$  inches.

**Razorbill.**—This sea-bird should be sought for along the coast where precipitous cliffs and rocks abound. Here it makes its home. No attempt is made at nest-building, the one handsome egg being placed in some hole or crevice on a rocky precipice or cliff-side. The ground colour is whitish, or white, with a buff tinge, spotted and blotched with reddish or chestnut-brown, or a very deep rich brown. The egg does not present the great variety exhibited by that of the Guillemot next to be described.

Small fish constitute the food. Sometimes a long-drawn-out cry is uttered; at others a lower and more guttural note may be heard.

The black axe-like beak, with a prominent white crescent-shaped mark across the deepest part, is in itself sufficient to

identify this bird ; the plumage is greenish-black on the upper parts ; dark brown on throat ; white underneath. Length, 17 inches.

**Common Guillemot.**—This bird resorts to very similar parts of the coast as the last mentioned, and the two species often nest quite close together. On the Yorkshire coast and elsewhere this is a very numerous bird, and quite a large trade is done in the nesting season by cliff-climbers in collecting eggs. As many as 500 eggs have been obtained as the result of one morning's haul. The bird only lays one pear-shaped egg. Large numbers of birds nest quite close together, and no nest whatever is constructed, the egg being deposited on the bare rock. The ledges are often crowded with the eggs and birds, but they are so difficult of access that they are fairly secure from molestation excepting where cliff-climbing is indulged in. A full illustrated account of this occupation is given in my book "The Story of the Sea and Seashore." The one egg varies in a most bewildering manner, and although many are very much alike, a great number are quite distinct. The ground colour may be green, white, yellowish, stone, whitish, or some other shade. Some are well blotched, spotted and streaked with dark colours, others are very sparingly marked. I know of a collection of over one thousand eggs of this bird, every one of which is distinct. Breeding in such immense numbers as this bird is in the habit of doing, it is wonderful to notice how it is that each pair of birds identify their one solitary egg. Here is a puzzle in Birdland that requires elucidation. The shell of the egg is chalky and hard, and well calculated to withstand the exposed position in which it is more frequently located. When seen upon a rock or cliff from the sea, Guillemots present a strange appearance, the white under parts standing out boldly against the blackish-brown head and throat. They sit bolt upright and remind one of the Penguin. Length, 18 inches.

Sprats and other fish are much relished by this interesting sea-bird, a typical feathered inhabitant of rocky fastnesses where the roar of the ocean is heard at all times of the year. The young Guillemot is called a Willock, whilst other curious

names given to the adult birds are those of Ellygug, Guillem, Kiddaw, Lary, Scout, Sea Hen, and Tinkershire.

*The notes uttered are very peculiar. Some may be compared to those of the Gulls; another one has been likened to a hoarse, long-drawn cry, like the commencement of a dog's howl before he has cleared his voice; still another utterance is like a succession of laughter-like notes, as well as a series of short barking notes similar to those uttered by some Geese and Ducks.*

**Puffin.**—The last bird on our list before we deal with a few of the commoner Autumn and Winter visitors, the Puffin, or Sea Parrot, as he is known to the fishermen, is a very common species at St. Kilda, the Shetland Isles, and on various parts of the Scottish coast. The outstanding feature of this bird is the massive sheath that is grown over the beak in the breeding season. This is bluish at the base, yellow on the middle, and bright red at the tip. When the breeding season is at an end the sheath falls off, and is not put on again until the following Spring. Even when the sheath is missing the beak is very Parrot-like, and the Puffin has a peculiar facial expression of his own. He is black above and white below; the legs and feet are orange-red. Length, 12 inches.

So common are these birds on the peaty soil at St. Kilda, that as many as 600 have been caught in one day. A light deal pole is used with a twig of hazel on the end, with a running noose of horsehair and quills attached. The islanders take up their position on a hill-side where the birds are gathered in large numbers, and slip the noose over the bird's head, and thus secure him. The birds are not in the least perturbed at the loss of a relative; indeed, are generally regarded as somewhat stupid in their habits. At the same time, it is a most interesting species to watch, and is certainly one of the most curious birds nesting in our country.

A hole around or in a rock, a cleft, crevice, or cranny, the burrow of a rabbit, or among turf at the summit of a cliff—such are a few of the nesting sites where the Puffin secretes her one solitary egg. This is almost white at first, but becomes spotted and marbled with a tinge of ash-colour as a result of being

soiled. Small fish usually constitutes the dietary, and when the young one is hatched and the "nest" has been placed in the burrow of a Rabbit or some other hole in the peaty soil, the youngster waits at the entrance for the return of the parent with food.

The call-note is a sort of "a-r-r" to "o-r-r," and sometimes "orr-a-orr."

I have seen this Auk-like bird in good numbers on Ailsa Craig, off the west coast of Scotland. There it is known as the Ailsa Cock and Ailsa Parrot, whilst near the Bass Rock, on the east coast of Scotland, it is called the Bass Cock. Other curious names worthy of mention are those of Cockandy, Coulterneb, Knifebill, Marrot, Pope, Tommy Noddy, Tammy Norie, and Skrabe.

Whatever else the Puffin may be, he is a model husband and a splendid fisherman. He has the habit of securing several fish in his beak and then still pursuing his operations without any apparent hindrance being caused by the fish already held in his mouth. How the bird manages to do this has for long been quite a mystery to me. Watch the crafty fisher as he dives and rises with more fish in his bill than he had when he entered the water, and endeavour to ascertain how he manages to carry out this clever feat. Even if you do not succeed in elucidating the mystery, you will be richly entertained by the bird's engaging habits, and spend a happy, healthy time among sea-birds in their native haunts.

## AUTUMN AND WINTER BIRD VISITORS

Many people seem to imagine that when the nesting season is at an end the bird student's work also ceases. This, however, is far from being the case, and I have long thought that the pleasures of bird work are considerably enhanced during the Autumn and Winter seasons. True enough, nearly all our Summer bird visitors have taken their departure, and most birds that are left behind are songless. The barren months of the year, however, are excellent times to observe birds at closer quarters and in more detail than when the wealth of Summer

foliage hides them from our view. Hard weather, too, often makes the most timorous species a fairly confiding and bold bird, and those kinds who resort to trees—such as the Titmice, Woodpeckers, Nuthatch, Tree-Creeper, and others—are to be observed to much greater advantage when the trees are leafless. Search for food often results in many rare birds turning up in unexpected localities; and when the great migration fever is at its height in the Autumn, it is a most entertaining time to sojourn near the coast, and take particular note of the various kinds of Waders, Ducks, Geese, and other feathered fowl who come down from their mountain and moorland fastnesses to pass the Winter upon our coastline and on our mud-flats.

As early as August immigrants appear from the Far North, where they have bred during the past Summer, and one never knows exactly what species is going to turn up each time one ventures forth on a bird-exploring expedition. Then, again, the change of plumage at the Autumn season, the distinct appearance of young birds of the year, and various other characteristics go to make the Autumn and Winter study of the bird-life of our country very interesting and useful. The young naturalist would do well to make a point of becoming an all-round-the-year worker, not making a habit of choosing the best days or the best seasons for his work. Many a fine chance of observing some particular animal or plant, or some interesting phenomenon of Nature, is frequently lost because people generally are so afraid of braving the elements and of making a vow to take their country pilgrimages all through the year. In this way, too, one is able to appreciate to the full the variety of the countryside, and the infinite charm which its inhabitants have at all times for the quiet worker and the industrious student.

One need not, moreover, reside at or near the coast to pursue most pleasurable and profitable journeys in this respect, for many indigenous birds of our woods and lanes, meadows and gardens, leave us at the Autumn season, and their places are taken by new arrivals from northern latitudes. The zealous and painstaking ornithologist is, or should be, as anxious to chronicle in the Autumn the arrival of the first Fieldfare,

Redwing, Jack Snipe, Woodcock, Brambling, Snow Bunting, Crossbill, Golden Plover, etc., as he is to herald the note of the wandering Cuckoo or the Nightingale in the thick briar-bush during the green flush of Spring.

Many birds that visit our coasts in Autumn are only passing along to sunnier climes, and resting occasionally upon the way. They do not make England their *permanent* Winter quarters, merely halting every now and again after they have first touched the coast in the North, until, having reached the southern extremity of our sea-girt isle, they fly across the English Channel and winter in more southern climes. We see no more of these visitors until early the following Spring. Some are then difficult to recognise again, because they have assumed their Summer plumage ready for the breeding season in northern countries. A careful watch may, however, be kept for the reappearance of these feathered travellers, and it is interesting to observe the anxiety they appear to possess to push onwards towards their nesting stations in the North.

There are, however, quite a number of different kinds of birds who do make England their permanent Winter quarters, and in this respect we may mention the Fieldfare, the Redwing, the Brambling, several Geese, Swans, Ducks, and others. Where there are large sheets of water inland, there one may watch with almost certain assurance for the appearance of many rare Fowl, and, better still, the vicinity of the coast is bound to result in quite a number of interesting and valuable records being made, especially if the Winter be at all severe. Along the coast (and the East Coast in particular), and on large sheets of water, such birds as Swans, Geese, Ducks, Sanderlings, Turnstones, Knots, Godwits, Stints, Sandpipers, Terns, Whimbrels, Curlews, Grey Plovers, etc., will appear. On some parts of our coast-line vast regiments of Bean, Pink-Footed, Brent, Grey Lag, and White-Fronted Geese may be observed in Winter, and a careful look-out should be kept for the Whooper and Bewick's Swans. Scoter Ducks, Pochards, Golden-Eye Ducks, Scaup Ducks, Long-Tailed Ducks, Bar-Tailed Godwits, Little Stints, Curlew-Sandpipers, Black Terns, Grey Phalaropes, Little Auks, Whimbrels, Skuas, Hooded

Crows, Golden Plovers, Ruffs, and other species too numerous to mention, may all be observed, more or less, during the Autumn and Winter seasons, and the young naturalist will find his time fully occupied during the few hours it is light in identifying successfully the great variety and abundance of strange feathered folk who gather along the coast or our large sheets of water.

Then, again, many rare birds are driven inland by stress of hunger. Sea-birds, as well as Geese and Swans, often make their appearance a long way from the sea, or fly overland in a tremendous rush to reach some Winter quarters away to the South of our island home.

In the fields Redwings and Fieldfares should be sought for and carefully observed, for we know them only as Winter visitors. In many districts also several kinds of birds, such as Meadow Pipits, Pied Wagtails, Golden Plovers, Siskins, Crossbills, Snow Buntings, and others, are only known as Winter migrants, although all these birds nest in the British Isles, but mostly in the extreme North. The Common Snipe nests in many boggy portions of our country, but in others it is purely a Winter visitor; whilst the Jack Snipe is a Winter visitor only, and does not nest with us.

Birds, like mankind, appear to have a keen desire for change, and it thus comes about that most British birds, at any rate, undergo a partial or temporary migration. The Thrush that nested in the laurel-bush in the garden, and sang such sweet lyrics from the oak-tree in the Spring, and the Thrush that comes to the bird-table in Winter, is not likely to be the same bird. Perchance, the individual who reared the spotted chicks in the plaster-cup nest in the garden in Summer has by Winter-time flown away to Egypt to bathe himself in the African sunlight. He will not return until the early Spring, but rest assured he will not fail you. In the Winter, however, the Summer Thrushes, as we will call them, having left us for sunnier climes, have their places taken by a large immigration of these birds from the North. Indeed, it is often apparent that in the Winter we have in England more Thrushes than during the Summer. When the bright days are returning, however,



the Winter Thrushes leave us for their northern homes, and by the time the first golden petals of the Celandine are prominently exhibiting their Spring resurrection, the Summer Thrush is back once more, ringing out his lilting strain, and ready to weave his nest in the old laurel-bush again.

This portion of our work might be indefinitely extended, but sufficient has been written to attract attention to this too often overlooked branch of bird-study, and I now leave the young ornithologist to carry out his own rambles among these interesting bird-folk, and wish him many happy days of successful hunting.

## CHAPTER IV

### CLASSES III. AND IV.—REPTILES AND AMPHIBIANS

#### Class III.—REPTILES

THE poverty of our British Reptiles and Amphibians is very marked, and when we come to consider the amount of attention which, as a matter of necessity, we are bound to give to the Birds and the Insects, for example, this poverty is most apparent.

The Latin word *rep'-til-is* is derived from *repère*=to creep, hence a creeping thing, and it is as well before proceeding to point out the salient features of our few British species to clearly show what a Reptile really is. My friend Dr. Gerald Leighton, in his most useful work devoted to "British Lizards," sets out in concise form a table of orders of which the Class Reptilia are made up, thus:

#### *Class Reptilia*

Order Chelonia (Turtles and Tortoises).

Order Crocodilia (Crocodiles, etc.).

Order Squamata or Sauria—

Sub-order Ophidia (Serpents).

Sub-order Lacertilia (Lizards).



REPTILES AND AMPHIBIANS

(for Details see over)

1. Common Viviparous Lizard (*Lacerta vivipara*)
2. Ringed Snake (*Trochidonotus natricus*)
3. Smooth Newt (*Molge vulgaris*)
4. Do (female)
5. Great Crested Newt (male) (*Molge cristata*)
6. Do (female)

Of the two first orders we have no representatives in this country, and on the present occasion we are concerned only with the two sub-orders of the Order *Squamata* or *Sauria*—namely, *Ophidia* and *Lacertilia*. We shall take the latter sub-order first and deal with the *Ophidia* next, but a few notes concerning Reptiles generally are necessary to give the young naturalist a clear idea of the animals we are now about to consider. To this end the following quotation from Dr. Leighton's admirable work will suffice: "Briefly, Reptiles may be described as the only vertebrate animals which are cold-blooded, which breathe by means of lungs throughout life, and which have the skull joined on to the vertebral column by a single median condyle or articulating surface. These few characters mark them off distinctly from the other vertebrate animals—the Amphibians, the Fishes, the Birds, and the Mammals." And again: "It will be sufficient, perhaps, for our present purpose if we state that the *Sauria* are the most recently developed Reptiles, and include both the *Ophidia*, or Serpents, and the *Lacertilia*, or Lizards. Looking now at the definition above, it becomes apparent that Lizards are distinguished from Serpents by the fact that in the former the two halves of the lower jaw are firmly united together by a bony suture or joint, which allows of no distension. In the Serpents, on the other hand, these two halves of the lower jaw are connected by an elastic ligament which allows of immense distension, an anatomical difference which we shall find has its functional counterpart in the different kinds of food swallowed."

It is very important that the young student should exercise great care in discriminating between a Snake and a Lizard, more especially in view of the fact that, whereas it may at once be stated that Snakes are legless and Lizards are not, we have a Snake-like species of Lizard known as the Slow or Blind Worm, which, although often erroneously considered a Snake because of its general appearance and the non-possession of any outward legs, is, as a matter of fact, a legless Lizard!

Among the *Lacertilia* there are known some 1,800 different species. Of this large number we are only able to claim three (if the Channel Islands be excepted), one of these, the

Slow Worm, claiming kinship with the family *Anguidæ*. Briefly stated, the distinguishing characteristics of Lizards may thus be given: Most species possess two pairs of limbs, one pair in front of the body and the second pair towards the end of the body. Some kinds, however, do not possess any external limbs, as already mentioned in the case of our own species of Slow-worm. The larger number of Lizards have movable eyelids, a feature that at once distinguishes them from the Snakes. The majority of Lizards have an external covering of scales.

The variety exhibited by these Reptiles is very great. They vary in colour, size, form, and structure. Some live a terrestrial life; others are semi-aquatic. Some are climbers, some quick runners, some fliers, some live underground. The greater number partake of an animal dietary, such as insects, worms, birds, and mammals; others, again, are profound vegetarians. According to their mode of life, so also are the form, structure, and habits adapted. Protective coloration is well displayed in many of the forms. Those inhabiting sandy tracts of country are so coloured that their bodies harmonise with the surroundings; those tenanted tropical vegetation, where all is brilliant and beautiful, possess wonderfully lurid markings exquisite to behold; whilst others, again, have the power, like the Chameleon, of more or less changing their hues.

The interesting device which the Lizard adopts for the purpose of protection—namely, snapping off the end of its tail—is well known, and has already been referred to in our introductory chapter. The lost portion is regained after a time, but is found to differ in some particulars from the part that was so willingly severed to enable the animal to make good its escape. Lizards, in a similar manner to Snakes, cast their slough periodically. This is sometimes carried out piecemeal; at others, wholly.

As a general rule the members of the *Lacertilia* deposit eggs, and we call these oviparous, those animals that produce their young alive being known as viviparous. The shell of the egg is either hard or somewhat membranous. When deposited,

the latter eggs increase in size as a result of the taking in of moisture. Other kinds of Lizards deposit their eggs at the time when the embryos are fully developed. These species we call ovi-viviparous. Others, again, are entirely viviparous—that is, bring forth their young in a living condition.

A good deal that has been incorporated in these introductory remarks is equally applicable to the *Ophidia*, or Snakes, and further dissertation is unnecessary. I should, however, like to invite the young naturalist's keen attention to the subject of reptilian study and research. Too little attention has been given to the life-histories of even the few species that we do possess in this country, and, had it not been for the painstaking labours of Dr. Arthur Stradling and Dr. Gerald Leighton, our knowledge would be very limited indeed. Granted, perhaps, that even our few British Reptiles are difficult to closely observe in a wild condition, much might be accomplished by the zealous young naturalist who is determined to specialise upon our reptilian fauna. If the reader is at all impressed with a desire to pursue this subject further, he may be sure of having a whole wealth of interesting matter revealed to him. Little harm, if any, will come his way, as we have only one venomous species—namely, the Adder; and he will find “British Lizards” and “British Serpents,” by Dr. Leighton, indispensable guides whether he studies the free animal or the captive pet.

#### Sub-Order—LACERTILIA, OR LIZARDS

**Common Lizard.**—Search should be made for this interesting species on heaths, commons, and moorlands, especially where the soil is of a sandy nature. Beyond this it is important to notice that this is the only Reptile to be found in Ireland. The general colour is reddish or brown above, spotted with dark and lighter colours. In the male the under parts are orange to red, prominently spotted with black, and yellow or pale orange in the female, either spotted or almost unspotted. The young ones are almost black when first born. The male measures about 6 inches, and the female about 7 inches.

The Common Lizard is smaller than the rarer Sand Lizard, next on our list, and with which it is often being confused.

Care should be taken to accurately identify any uncertain specimen, and some good textbook, such as Dr. Leighton's, should be carefully consulted. It should be pointed out, however, that whereas the Common Lizard is viviparous, as its specific Latin name of *Vivipara* denotes, the Sand Lizard is oviparous. The former is an active, engaging Reptile, and difficult to catch. One may observe the wary creature taking a sun-bath on a bare patch of earth, but on close approach the animal scuttles off into the undergrowth, and stealthily contrives to thread its way, so to speak, through the herbage until secure from intrusion. It is said to be an expert swimmer, and to readily take to the water. It does not take kindly to being handled, and wriggles continually until it is again given its liberty. Insects constitute the food, and these the Lizard captures hastily and adroitly. Flies and various Beetles are partaken of.

Six to twelve young ones are produced, and these are either born within the female, or the egg-membrane is burst immediately after they have left her body. Thus this species is, strictly speaking, both viviparous and ovo-viviparous. The young ones are deposited upon the ground, and measure about 1 inch at birth. The mother takes no heed of her progeny once they are born, but as they are soon able to take care of themselves, parental guidance and care are unnecessary. For a few days food does not appear to be captured, the body of the youngster being sustained by the egg-yolk that has been already partaken of. The young one takes shelter under various herbage until hunger asserts itself, and then it commences to catch various small insects on its own account.

**Sand Lizard.**—This rare Lizard is restricted, as Dr. Leighton tells us, to the southern counties, such as Dorset, Hants, and Surrey. The colour variation in Lizards accounts for the amount of confusion that exists as to the Common Lizard and the present species, but the distinguishing features already referred to, and the present description, should enable the young Reptile-hunter to be on the right track.

The Sand Lizard is less active than its commoner relative: has granular nodes above the eye, as well as teeth upon the



SAND LIZARD (MALE)

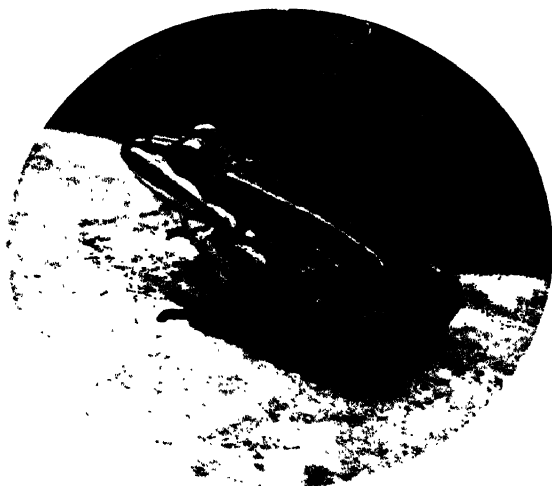


SLOW WORM AND YOUNG ONE





GRASS, OR RINGED SNAKE.



FROG.

palate bone. The latter is a most characteristic distinction. Although, as has been stated, the coloration in these Lizards is very variable, the general colour of the male and female Sand Lizards may thus be given: Male, grass-green on sides; yellowish-green underneath, spotted with black; black dots on sides, with whitish eye-spots. Female, grey and brown above, spotted with dark-brown with white centres. These spots are arranged in three rows on either side of the body. Cream-coloured under parts, sometimes specked with black. The young are grey-brown on the upper parts, spotted with white with black edges; whitish underneath. Length of male, about  $7\frac{1}{2}$  inches; female, about 8 inches.

This Lizard is very fond of sandy districts, as its name implies. It can there burrow for the purpose of hibernation, and the warmth of the sand helps to incubate the eggs. It loves a sunny bank, and I have seen these Lizards on a bright day on a sandy heath not far from Poole, in Dorsetshire, enjoying a sun-bath. It is useless to hunt for it unless the sun is shining, for cold drives it to its underground home. The food is insectivorous, as in the last species described. The eggs are laid about July, and number from five to twelve. A depression is made by the female in the sand, and she there deposits them. The sun and moisture do their work well, and both aid in hatching out the young. The covering of the egg is a membrane, which, although thin, is firm, and has been compared to parchment. The greatest enemy of this Lizard in our own country is the Smooth Snake.

**Slow-worm.**—This most interesting legless Lizard—for such it is, and not a Snake, as is so often supposed—is often killed because of its supposed vicious and venomous character. Known variously as the Slow-worm and the Blind Worm, this Reptile cannot be said to be particularly slow in its movements, and it most certainly is not blind. It possesses eyelids, and these having been seen closed has doubtless resulted in the stupid name of “blind” being accorded to it.

Whilst, perhaps, somewhat Snake-like in general appearance to those people unacquainted with our Reptilian Fauna, the Slow-worm may at once be identified without dissection. It has

movable eyelids; Snakes do not possess any. It has rows of scales on the belly, whilst Snakes have a single large broad scale extending from one side of the belly to the other. It has a tail as long as the body; Snakes have tails that are shorter than the body.

Dr. Leighton has given us an excellent table of differences between Lizards and Snakes, and, although I have already used this table elsewhere, it is very important to emphasise here the distinctions that exist between these two Reptilian Orders. Here is the table:

| <i>Lacertilia, or Lizards</i> | <i>Ophidia, or Snakes</i>     |
|-------------------------------|-------------------------------|
| Limbs present or rudiments.   | Limbs absent.                 |
| Eyelids present.              | Eyelids absent.               |
| Belly-scales in several rows. | Belly-scales in one row.      |
| Jaws firmly united.           | Jaws widely distensible.      |
| Teeth conical (as a rule).    | Teeth recurved.               |
| Tongue notched.               | Tongue deeply bifid.          |
| All are innocuous.            | One British species venomous. |
| Sternum present.              | Sternum absent.               |
| Urinary bladder present.      | Urinary bladder absent.       |

It would be well for the young naturalist to carefully study this valuable table, for by its aid he should easily be able to distinguish at once between a Lizard and a Snake.

The Slow-worm, then, although Snake-like and possessing no external limbs, is undoubtedly a Lizard, if for no other reasons because it has hidden rudimentary limbs, eyelids, belly-scales in several rows, jaws firmly united, a notched tongue, it is innocuous, etc.

The rudimentary limbs in this creature are exceedingly interesting, and cause it to be placed in a separate family—the *Anguixæ*, and although it would be incorrect to write of the Slow-worm other than as a *Snake-like Lizard*, it does serve to show some sort of connecting-link between Lizards and Snakes worth noticing.

This is a commonly distributed Lizard in the British Isles, but is absent from Ireland. I have found it particularly common in some parts of Bedfordshire and Kent. Size and

colour both vary, and in the description of these Lizards one is likely to go astray unless great care is taken. The reader would do well to carefully follow the various photographs here reproduced, which should really be more useful than any written description.

The length of the Slow-worm is from 12 to 15 inches or more. It possesses bright shiny eyes, a very smooth skin, black notched tongue, no lateral fold, nor fold near the neck, like our other Lizards, and is covered all over with very smooth, shining, and rounded scales. There is a thin dark line running along the side of the body, and another one down the back. The creature does not possess any alluring markings, like so many of its handsome relatives, and is grey or brownish, or bright copper or bluish. The young have silvery-white above, and black bellies; there is a strong dark line down the back. It is wonderfully protected by its coloration, and, as it will remain perfectly motionless, is doubtless often overlooked. When the weather is dull it will conceal its body under stones and herbage, but when the sun shines, being cold-blooded, it loves to bathe its body in the warmth afforded.

Similar to the other Lizards, this interesting member has the habit of bidding good-bye to a portion of its tail if necessity demands it. This is, of course, of great service to it in assisting evasion of its enemies. For instance, if a Slow-worm be attacked from behind, a sudden release of a part of the tail would leave the would-be captor the proud possessor of a portion of the caudal appendage only, and the Slow-worm can hie away and commence to grow another piece! The Reptile actually saves its life by giving up a portion of its own body. This Lizard glides smoothly through the herbage without any apparent exertion, and, whilst mostly slow and deliberate, can on occasions move with quickness and despatch. Slugs are the favourite food, but it is said that Earthworms and insects are also eaten when the former are not procurable. Much good must of necessity be performed by this Reptile as regards the destruction of Slugs, for Dr. Leighton tells us of one in his possession who ate seventeen at a sitting! If only gardeners realised what a boon the Slow-worm is in coming

forth at nightfall to feed upon the detestable Slugs—one of their worst enemies—they would, I feel sure, protect and preserve these Reptiles more than they do. Instances frequently come under my notice of Slow-worms being killed because of their supposed venom, and it cannot be too strongly emphasised that they are, as a matter of fact, among the most useful animals we possess.

In reproduction the Slow-worm is viviparous or ovoviviparous, which means either that the young are produced alive or that the young have been carried to full time within an egg-membrane. The breeding season is August or September, and the young vary in number from four to twelve. At birth they measure about a couple of inches long. The Slow-worm casts its skin, like other Lizards and Snakes, and in the fields around Whitstable, in Kent, I have found them, both in pieces and whole. The animal hibernates during the Winter, but does not seem to feel the cold so much as some other Reptiles, and may be seen sunning itself on a warm Winter's day. The Adder appears to be the chief enemy of this species, and next to that Reptile, man himself.

Resorting as the Slow-worm does to hedgerows, fields, and lanes near villages and other dwellings, the harmless creature practically courts disaster, and it should be the aim of every naturalist to lose no opportunity of pointing out the good which our Reptiles and Amphibians perform because of the general dislike that attends them.

Much more might be written of this Lizard—of the manner in which it captures food, its disposition, etc.; but sufficient has been written, perhaps, to draw attention to its interesting life-history, so that the young naturalist will be inspired to add to his share of knowledge on his own account.

#### Sub-Order—OPHIDIA, OR SNAKES

**Adder.**—This is our only venomous Reptile, and may at once be distinguished from the two remaining species by its small size (average length, 18 inches), the dark zigzag line which runs along the back, and the black V-shaped patch borne upon the crown. The head is blunt, and bears upon it

smaller and more numerous plates than the two other species upon our list.

It varies in colour a great deal, and Mr. Aflalo states that examples are found showing every shade of brown to black. In many southern parts of our island it is a common Reptile, but becomes rarer in the North. On the Yorkshire moors I have found it more common than elsewhere. In Hertfordshire it appears exceedingly uncommon, and although I have been naturalising in the county regularly for over twenty-five years, I have never seen a Snake within the Hertfordshire borders as yet. I have, however, seen this species in the adjoining county of Bedford. It may be that I have been singularly unfortunate, but it appears to me that Charles Lamb's homely Hertfordshire is particularly free from Reptiles of any kind.

The Adder, or Viper, as it is often called, is viviparous, and in this way differs from its harmless relative the Grass Snake, next on our list. The young vary in number from fourteen to forty. The egg is thin-shelled, and is hatched out in the body of the female.

On seeing the forked tongue protrude from the mouth the young naturalist might, on first acquaintance, consider this organ to be the one with which it carries out its sometimes fatal habit. This is, as a matter of fact, accomplished by means of two fangs; the tongue has nothing whatever to do with the performance. The Reptile bites severely, and having made an incision with its fangs, a greenish venom is carried down the fang into the wound that has been made. Then the fangs are drawn out, but only to be re-inserted without the slightest hesitation. The Adder, however, rarely attacks a person unless "cornered," and I know several professional naturalists who will pick up one without the slightest fear. They have handled dozens, and no harm has ever come to them. Fatal cases are on record, but they are few and far between.

The food consists of small birds and their eggs, Mice, Lizards, and insects. These are procured by the Adder moving its jaws independently of its fangs. Similar to other Snakes,

this species sheds its skin with regularity. The creature wriggles until it practically turns itself inside out, even to the eye-covers. During the Winter it hibernates, and, unless disturbed, will so remain until early Spring.

In the New Forest, in Hampshire, this species is very plentiful, and this reminds me that a few notes concerning a well-known and interesting personage who was the Snake-catcher there for a number of years may be read with interest.

The death of the veteran Snake-catcher of the New Forest, "Brusher" Mills, as he was popularly known, revived the oft-disputed question as to whether the Adder does or does not swallow its young in the time of danger. Into this very intricate and debatable subject we do not propose to enter at the present juncture, but a few notes about the wonderful old hermit who for so long made his home in the New Forest may be given.

The old man's proper name was Mills, but he was much more generally known as "Brusher." This honourable title he acquired—so rumour has it, at any rate—"by the zeal with which his sporting instincts prompted him to sweep the wicket of the New Forest Cricket Ground between the innings"! He lived for many years a hermit's life in the Forest, dwelling in a little hut something like that of a charcoal-burner, but the profession he followed was not burning charcoal, for he obtained his scanty livelihood by catching Snakes! The reader probably wonders where "Brusher" found a market for the Reptiles. His best customer seems to have been Lord Londesborough, when that gentleman used to live at Northernwood, near Lyndhurst, for his lordship is stated to have rewarded "Brusher" with a shilling a head for every Snake (Ringed Snake or Adder, Slow-worms not counting) procured alive, for the purpose of sending to the Zoological Gardens in Regent's Park, for feeding certain cannibal Snakes, known as Hamadryads. After Lord Londesborough's removal "Brusher" still supplied the authorities at the Zoo, but it is understood the terms he obtained when dealing direct were not so liberal as when he had the honour of serving his lordly patron. "Brusher" was Snake-catching for over fifteen years, and

during that time it is calculated he caught over 4,000 Adders and over 2,000 Ringed Snakes, or something over 6,000 in all. With much dexterity he would pick up the Snakes between his fingers and transfer them to the large tin can which he carried fastened to his waist. He was in many ways a decidedly quaint and interesting character, and exceedingly fond of rum.

"Brusher" used to declare that he had seen Adders swallow their young hundreds of times, and offered to show the performance to others—to the sceptical Mr. Tegetmeier, if he pleased—any time in the months of July and August. Unfortunately for "Brusher," the venerable Mr. Tegetmeier took him at his word, and went down into the Forest, but Mills utterly failed to convince his visitor in any way that the Adder does perform the curious habit with which it has been so frequently accredited. Perhaps no man in the British Isles was more likely to be able to throw some light upon this Adder-swallowing-young controversy than "Brusher" Mills, and it is a thousand pities that he has gone down to his grave with the question as far removed from settlement as ever it was.

**Common, Grass, or Ringed Snake.**—Having seen several specimens of the Common, Grass, or Ringed Snake suffer the penalty of death because of their supposed venomous nature, I should like to emphasise here the fact that this beautiful British Reptile is absolutely harmless. It is a thousand pities that such a harmless creature should, without thought, be instantly despatched in the manner in which I have far too often seen it, and it should be the aim of all true lovers of the wild tenants of the countryside to impart to their fellows such information as will lead them in future to cease from killing this harmless Reptile. It may be distinguished from the venomous Adder, or Viper, by having no dark zigzag line down the centre of the back, nor the V-shaped patch of black on the crown of its head. The Grass Snake has a yellow patch on the side of the head, and dark blotches on the side of the body, the latter being mostly greenish-olive in coloration. It is our largest Snake, and the commonest. The length of the specimens which have come under my notice



recently has been 30 inches, and from this to 36 inches is the average length. Specimens, however, measuring over 5 feet have been recorded. The tail of this species tapers off almost to a point, and this is a very important thing to remember in view of the fact that the tail of the Adder is *blunt*. This Reptile is oviparous, and deposits from twenty-four to forty-eight eggs in a manure heap, the warmth of the latter greatly assisting incubation. The eggs have a leathery shell; they absorb moisture, and attain twice their original size. When first born the young are dark in colour, the only light portion being on the collar. The Grass Snake feeds very largely on Frogs and Toads, as also on wild birds and their eggs; and in regard to the latter, I have an interesting series of records to chronicle, which must be reserved for some future occasion.

**Smooth Snake.**—This is our rarest Snake, and is not likely to come under the notice of the young Reptile-hunter. A short description may be given of it, however, so that our three British species may all be described. It is reddish-brown, and bears a double row of black spots. It feeds very largely upon Lizards. It is viviparous and quite harmless. The average length is about 24 inches.

**Death-Feigning Instinct in a Snake.**—A remarkable example of the death-feigning instinct has been described in the *Proceedings of the Biological Society of Washington*, in the case of the American hog-nosed Snake, *Heterodon platyrhinus*. When this Snake is first alarmed it flattens its head and neck, puffs out its body, and begins to hiss. Should these intimidating efforts fail to frighten away the enemy, another plan is tried. The Reptile throws itself into violent contortions, during which the remnants of its last meal are in many instances vomited up. After continuing for a few minutes, these writhings gradually diminish in intensity until the Snake finally lies inert on its back, as if defunct. In this posture the Reptile may remain from a few seconds to many minutes, the instinct to simulate death being so strongly developed that if the inert body be turned over to the normal position the Snake immediately returns to the deadliest attitude at its command. Whenever the spasmodic paroxysms reach the contortion stage the series



COMMON TOAD



RINGED SNAKES EMERGING FROM EGGS



of actions is continued to the end. Young Snakes usually cease the performance after a few seconds, but old ones will frequently feign death for ten minutes, while with a little attention they can be induced to remain inert for fully an hour.

#### Class IV.—AMPHIBIANS, OR FROGS, TOADS, AND NEWTS

**Frogs and Toads.**—We now come to the Amphibians, which embrace the Frogs, Toads, and Newts. These animals pass some time of their lives in the water as well as on land; thus the derivation of the word Amphibian may be given: Latin *am-phi-bi-i-an*; from the Greek *amphi* = double, and *bios* = life; hence, living a double life—that is, on land and in water.

Whilst some Mammals, such as the Otter, the Beaver, the Water Vole, the Seal, and some others, are partly amphibious in their habits, as also various kinds of birds, insects, Spiders, etc., a true Amphibian possesses gills like a fish during its early life. These are necessary to enable the creature to breathe under water. As the wonderful metamorphosis is proceeded with, however, it will be noticed that the young Amphibian (Frog, Toad, or Newt) undergoes a very great change. It is gradually assuming such form and structure as will suit its life upon land. The gills and other structures disappear, and lungs, suitable for breathing in the open air, and legs, wherewith to move on land, are formed.

Amphibians, it should be noted, are all produced from eggs, and they undergo, more or less, a similar metamorphosis to most insects. Then, again, Amphibians are small creatures, and in the five great classes of Vertebrate Animals—Mammals, Birds, Reptiles, Amphibians, and Fishes—there are fewer Amphibians than in any other class. The eggs of the Frog, Toad, and Newt differ as regards the form assumed when deposited, for the eggs of the Frog are laid in a mass, those of the Toad in long double chains, and those of the Newt are laid one by one each under the leaf of some aquatic plant.

The metamorphosis that a Frog passes through (and the same rule holds good for both the Toad and the Newt) has already been given in some detail in our Introduction (pp. 12-13), and to these reference should be made. Better still, the young naturalist should have his own aquaria at home or at school, and study these vastly interesting creatures at first hand.

We may now proceed to give the salient features of our seven British species of amphibious animals, mentioning as we proceed several points which need not be detailed in these preliminary notes.

**Common Frog.**—One of the most interesting sights during the early Summer is to light upon a company of young Frogs migrating from the ponds where they were born. This wonderfully fascinating sight may be witnessed towards the end of May, perhaps, but for certain in June. Many times during my country wanderings I have lighted upon thousands of tiny frogs hopping across a roadway; so thick have they been that it has been impossible to take a step for fear of stamping some of the brave little wanderers out of existence. Perhaps the life-history of no wild creature is so wonderful as that of even the too-often-despised Frog. When in the water—where the mass of yellowish-green spawn is deposited and the young hatched—the Tadpoles breathe by means of gills, like a fish. In the first instance they possess tails, and propel themselves through the water by rapidly moving this organ from left to right. Gradually, however, the tail disappears, rudimentary legs may be observed forming, and by-and-by the bull-dog head of the Tadpole stage becomes more Frog-like, the gills disappear, and the youngster comes forth to land, and breathes—like you and me—by means of lungs. When we meet them, then, during June, they are migrating in vast regiments to the ditches surrounding the fields and to the fields themselves—especially those of a marshy nature. Should a shower of rain fall to refresh the parched earth, the young Frogs revel in the moisture, and the country rustic on seeing them at once jumps to the conclusion that it has literally rained Frogs, and that they have descended from the skies!

Here I should like to put in a word on behalf of the Frog and his near relative the Toad, for both must be reckoned among the most useful country tenants we possess, ridding the land of great quantities of obnoxious insects and being almost absolutely insectivorous in their diets. The "spitting" of either creature is, of course, pure fiction, and cannot be too strongly condemned and written and spoken of as ridiculous. True, the Toad secretes in its warty skin a sticky substance, which it has the power of exuding when an enemy preys upon it, but this is the extent of the ridiculous "spitting" with which it has far too long been accredited.

Search should be made around ponds in early Spring—about March—for the masses of spawn that are deposited by the female Frog, and a most interesting time may be spent watching the creatures during the breeding season. Many ponds known to me since boyhood appear favourite spawning places, and to these I make my way year after year to witness this remarkable revolution in the great cycle of Nature.

In spite of statements to the contrary by one of our foremost naturalists, I have found both the Frog and the Toad breeding in large quantities *in the same pond*. The manner in which the eggs are deposited makes identification comparatively easy, for the eggs of the Frog will be found in a mass and those of the Toad in long chains. They both float on the surface of the water. It seems remarkable that, inhabiting the same water, as Frogs and Toads sometimes do during the breeding season, interbreeding should not take place! I have examined some hundreds of examples, but have never observed any crossing. Here we have an illustration of a wonderful moral law in a low type of animal difficult to comprehend, and one which to my mind requires a good deal of explanation.

When in the tadpole state, the Frog feeds on small organisms and water plants; but, as has been mentioned, when the adult stage is reached, insects and Earthworms constitute the dietary. The long tongue is tipped with a sticky substance, and is thrust in and out with great rapidity. To set out in detail the further characteristics of our common Frog is unnecessary. Having followed its early life-history, as I hope

you have, in our opening chapter (pp. 12-13), it is only essential that the colour of the adult animal should be given. The female is the larger of the two, as an examination of a pair during the breeding season will at once show. The colour is brownish, and the skin may be spotted or unspotted. The hind-leg is long and the toes are webbed; in the breeding season the fore-foot of the male bears a swelling, which should also be sought for. The colour differs a good deal according to the habitat, and it has been stated that the Frog has the power of changing its colour in a similar way to some other animals.

It is very remarkable how quickly a young Frog grows, for one I had in my garden last Summer was, when first observed, quite a tiny creature, and had probably just migrated from its watery home. In a few weeks' time it became quite two-thirds fully grown, thus testifying to the abundance of insect life upon which it fed, and of which I was only too pleased to be rid. Beyond affording a considerable amount of pleasure in watching the development of my amphibious visitor, I was conscious of the fact that it was performing useful service among the insect hordes that infested the garden.

**Edible Frog.**—This species is somewhat larger than its commoner relative. It was introduced into our country from the Continent, where, of course, it forms an article of diet, being a favourite dish among the French people. From reports that reach me it appears to be increasing its range in various parts of our country, and is not restricted to the Fens, as Mr. Aflalo seems to imply. Care should be taken in identifying this species, and the following description might with advantage be consulted: Length, about  $3\frac{1}{4}$  inches; length of common Frog, about 3 inches. General colour greenish, with black markings on back, and white lines. Skin folded at the throat; hind-toes completely webbed; vocal sacs on sides of head, by means of which the croaking during the breeding season is performed. The Common Frog also carries out this love agency, and of a Spring evening, when all is still, it is a very weird experience to listen to a number of Frogs emitting this vocal chorus.

**Common Toad.**—The Toad is not nearly so aquatic in its habits as the Frog. It is, as a matter of fact, more or less terrestrial, and although regarded even with disgust by many people, is of great service in the destruction of insects. To observe a Toad feeding, which it accomplishes by thrusting out the tongue with lightning rapidity, reminds one, as Mr. Aflalo remarks, of the curious Chameleon, which one may see feeding at the Zoological Gardens.

The Toad does not possess any teeth, like the Frog. The tongue is tipped with a gummy substance, which enables the animal to lick up an insect with great facility of despatch, the insect securely adhering to the wonderful organ, and in less time than it takes to tell the story it has been conveyed within. Insects have to be extremely cute and well-hidden when the Toad is feeling hungry, for, by the aid of the tongue and the microscopic eyes, the insect is deftly located, soon hauled from its hiding-place, and at once helps to appease the animal's appetite. When not feeding, the Toad is of a sluggish disposition. It reminds one somewhat of the Shag or the Cormorant amongst birds. When either of the latter are espied sitting disconsolately upon some rock or boulder by the sea, they appear particularly sluggish birds. At the approach of hunger, however, a different tale has to be told. The birds throw off their sluggishness, and cleverly and adroitly snatch up fish from the ever-fruitful sea, a direct contrast to their otherwise sluggish disposition.

The ridiculous statements which are continually being made and circulated as to the "spitting" of the Toad have already been referred to on p. 283, the fable—for such it is—having presumably arisen owing to a sticky secretion given off from the skin in self-defence. It is another instance of the means adopted for the survival of the fittest, for there are several species of animals (including birds) which would doubtless prey upon Toads in the same manner as they do upon Frogs were it not for the fact that the Toad is able to throw off this irritant secretion, and as a result the Toad is immune from such attacks.

The dark warty skin, short hind-legs, prominent swellings



over the eyes, and clumsy attitudes, easily identify the Toad from its near relative the Frog. It spawns, like the Frog, in water, and the well-known Tadpole is the result after hatching. The Tadpole of the Toad, however, is darker than that of the Frog. I have often been asked to give an opinion upon the stories circulated as to disinterred Toads which were said to have been obtained from solid blocks of sandstone and other stratum where, it has been stated, they must have remained buried for a great number of years. Candidly, I do not for one moment credit such occurrences, and regard them with the gravest suspicion. Like the Reptiles, Frogs, Toads, and Newts cast their skins periodically. The Toad casts its transparent slough once or more in twelve months, and, as a change in its dietary, often swallows it!

During the Winter both Frogs and Toads hibernate under stones, in crevices of walls, under the ground, in outhouses, and other places, secure from frost-bite and the rigours of hard weather. The Toad, as has been stated, is not so fond of the water as the Frog, excepting when spawning, and a favourite resort is a damp hedge-bank, or among stones in some moist situation.

**Natterjack Toad.**—This rarer Toad is smaller than the Common species, and may be identified by having a light line along the middle of the back. The hind-toes are not so fully webbed as in the last species, and the hind-leg is shorter. It is more active in its disposition, but in its non-aquatic habits and general life-history it much resembles the species already described. The light line down the centre of the back has resulted in this Amphibian being called "Golden Back" in some localities. It feeds on insects and, it is stated, on small mice.

An interesting account of "tickling" the Toad was given by Mr. W. B. Tomlinson in an American magazine not long since, and as it serves to show how some kinds of animals that are detested by many people are made full use of by others, it is interesting to quote it here. Mr. Tomlinson says:

"A fact not generally known is that the presence of Toads and Turtles is encouraged in large floral establishments, while Mice are pests to be eradicated. The latter, however, disturb

no flowers except carnations. Climbing the stalks, they gnaw off the buds and blossoms. When these have fallen, they descend and feed upon them. Why don't they keep Cats in greenhouses? Fancy an impetuous Feline, with no restraining taste for the beautiful, dashing about among the delicate potted shrubs in a greenhouse!

"A few days ago, at a large floral farm, the writer, entering a greenhouse, saw one of the proprietors making strange motions with a stick, which he held outstretched. Closer inspection revealed a large, rusty Toad under a shrub. Sometimes it would lick the end of the stick, and sometimes bite it playfully like a Dog. When its ugly back was scratched, it would hump itself with pleasure like a Cat when you stroke it. When the stick was withdrawn a few inches the Toad hopped to it, and humped himself again with an unmistakable appeal for more scratching.

"Are these your pets, Mr. Hervus?"

"Well, yes, in a sense they are. We're not the warmest bosom friends, but we have a pretty fair understanding. I'm rather fond of Toads. See that old Turtle back under the leaves? He's just a little bit jealous. I can tell by his eyes. It doesn't do any good to tickle his back, but watch him chew the stick! He's a nice old fellow!

"Yes, we're glad to keep them around. The Turtles stay pretty well, but the migratory Toad is liable to hop off and never find his way back."

"They live on insects, eh?"

"No, not altogether. I was just going to turn over this little patch of earth—too many Angeworms in it. Now watch!"

"He clanked his spade several times against the stone coping of a flower-bed. Answering rustles sounded from the low foliage in half a dozen directions, and the Turtles hurried toward him. While he broke up the clods and tossed out the worms, they were as eager as a flock of Chickens after a handful of corn. At a respectful distance quite a 'scatterment' of Toads looked on with envious eyes.

"Oh yes, we feed them often. It pays to keep on good terms with the Turtles."

“Having finished their grateful repast (if Turtles know what gratitude is), they waddled off again, one by one, to their leafy hiding-places.”

**Newts.**—These amphibious animals are sometimes mistaken for Lizards; but the latter is a terrestrial animal, as has already been shown, and does not undergo the metamorphosis of the Newt, the young Lizard resembling its parent excepting in size. In its early life-history the Newt passes its existence as a Tadpole in the water, in a similar manner to the Frog and the Toad. Again, the skin of the Newt is soft and moist, like that of the Frog, whilst that of the Lizard is composed of dry scales, which are more after the nature of those possessed by a Snake. The tail of the Lizard is round and tapering; that of the Newt is flat, and adapted for swimming purposes. Unlike the eggs of the Frog and the Toad, the female Newt deposits each egg one by one under the leaf of a water-plant. Then, by the aid of her limbs, she contrives to cleverly fold the leaf over the egg, so that it is quite enveloped and thus made secure. The egg hatches in about fourteen days; the little Tadpole comes forth from its hiding-place, and in about a further week or so the limbs begin to appear. As these make their appearance the gills commence to disappear, as in the Tadpoles of the Frog and the Toad, and when a little more than one month old, the young Newt leaves the water. It then resorts to the surroundings of the water where it was hatched, or to a marshy place of some kind. It does not resort to the water again until it is three or four years of age; then it does so for the purpose of depositing its eggs. The Great Water Newt, however, is much more aquatic in its habits.

Newts, like Frogs and Toads, also breathe through their skin, and this has been called a supplemental breathing apparatus. All these Amphibians are oviparous, spawning like fish. One of the most interesting phases of Newt life is that during the breeding season these Amphibians assume an ornamental crest, as well as additional webbing upon the toes.

In most country districts this creature is called an Eft, or



SMOOTH NEWTS (MALE AND FEMALE)



GREAT WATER NEWT (FEMALE)



Wet Eft. Newt and Eft are derived from the old Saxon word *efeta*. We may now briefly describe our three British species.

**Common, or Smooth, Newt.**—This is a handsome species, being green or brown in colour and very generously spotted. The under parts are yellow, spotted with black. The flattened tail of the male is red on the under surface, marked with bluish, whilst that of the female is the same colour, but lacks the bluish markings. The male and female are both ornamented with a crest, or frill, during the breeding season, but that of the male is the larger of the two. It is described as a festooned frill, and is borne along the back. Length, about  $3\frac{1}{2}$  inches.

**Palmated Newt.**—This is our smallest British species, averaging a length of about 3 inches. The body is darkly spotted. There are dark lines upon the head, and this latter also bears black specks. The crest has black edges, and it is not festooned, as in the last species. These Newts are most interesting animals at all times, but particularly so during the breeding season. The present species, for example, beyond assuming the crest already referred to, has the toes webbed at the nuptial period, as also a curious kind of filament upon the tail.

**Great Water Newt.**—This species averages a length of about 5 inches, and is the largest of the three kinds we possess. It is black on the upper parts and yellow below, spotted with black. The male is adorned with a handsome serrated crest during the breeding season. Beyond this it also has a light band upon the tail. It is worth noticing that, whereas the Frog and Toad Tadpoles lose their tails, the Newt Tadpole does not, the appendage being retained. The body of this Newt is warty, and it also possesses pores on various parts. By these features this Newt may at once be distinguished. The chief food of Newts consists of Frog Tadpoles.

As Mr. Alfonzo Gardiner states, Frogs, Toads, and Newts are useful both in their young and adult state. As Tadpoles, they keep the water sweet and clear by eating refuse vegetable matter, which would soon make it corrupt. When full grown they feed on countless numbers of minute aquatic creatures,

which would otherwise increase in such numbers as to choke up the water and make it impossible for animals to drink it; whilst on land they also devour millions of flies, gnats, and other small insects, which, if they were not got rid of in this way, would make it impossible for us to breathe the air with any degree of comfort.

## CHAPTER V

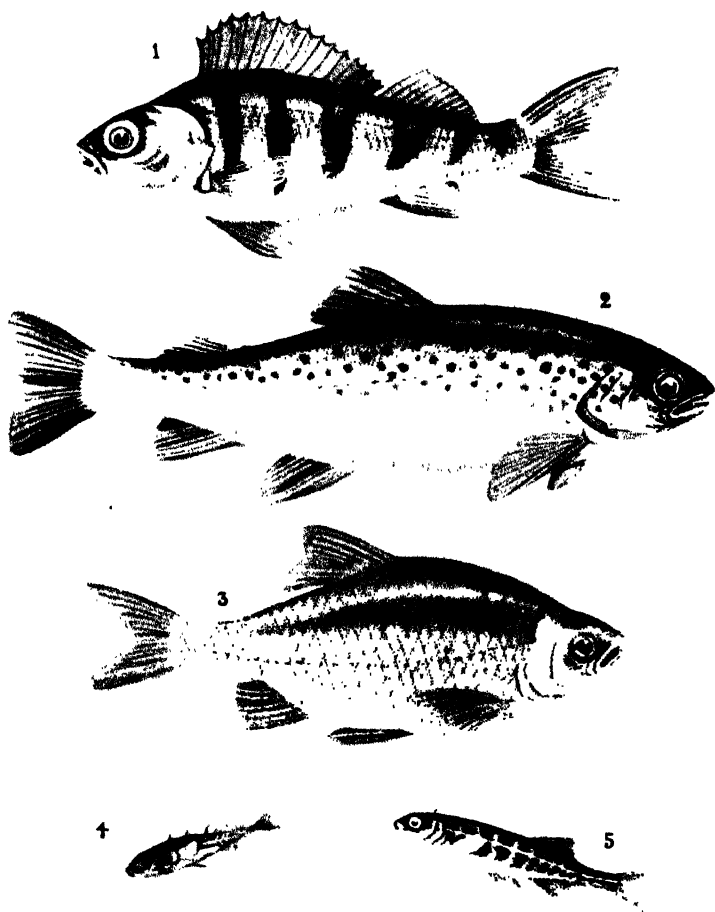
### CLASS V.—FRESH-WATER FISHES

**W**E have now to consider the last class of Vertebrates represented upon our list—namely, the Fishes—for it will be remembered that on p. 50 we set out six classes of vertebrate animals, but decided to deal with the first five only—namely, first, the Mammals; second, the Birds; third, the Reptiles; fourth, the Amphibians; and, fifth, the Fishes.

Although such a low class of Vertebrates, it will at once be recognised that fishes are of much interest, and most certainly of great importance. There are about 200 species upon the British list—that is, salt- and fresh-water inhabitants—but of these there are only about fifty coming under the latter category. Of this number, again, several are unlikely to come under the notice of the young ichthyologist, as the student of fishes is called, and we shall therefore content ourselves by describing some two dozen of the commoner kinds.

It is quite impossible in this volume to devote attention to salt-water fishes, but the young naturalist would do well not to overlook the many interesting and important families, such as the Mackerels, the Cods, the Flat Fish, the Herrings, the Sharks and Rays, and others who inhabit the ocean, and about whom, but for considerations of space, much might be written.

For the purpose of giving a clear idea of the salient features of fish-life, I am enabled, through the kindness of Messrs. E. J. Arnold and Son, Limited, Educational Publishers, Leeds, to quote extensively from a pamphlet issued by them in connection with their most useful Cabinets of Natural History



FRESH-WATER FISHES

*Gen. Peters see above*



1. **Perch** (*Perca fluviatilis*)
2. **Common Trout** (*Salmo gairdneri*)
3. **Rudd** (*Lepomis microlophus*)
4. **Three-spined Stickleback** (*Gasterosteus aculeatus*)
5. **Minnow** (*Leuciscus phoxinus*)

objects, to which I cordially direct attention. For teachers, societies, and also private individuals, these "A. L." Natural History Cabinets, as they are called, are of the greatest service and educational use. The descriptive booklet accompanying each case is written by Mr. Alfonzo Gardiner, and from the little "Handbook on Fish-Life" I am enabled, through the courtesy of Messrs. Arnold and Son, to quote the following interesting and useful information. Mr. Gardiner writes:

*"How Fishes are Fitted to Live in the Water.*—Fishes, like land animals, cannot live without breathing air, but they obtain the air necessary to purify their blood in a different manner to land animals. If they cannot get air to breathe, they die of suffocation. Air is chiefly composed of two gases—*Oxygen* and *Nitrogen*—and a certain amount of this air is mixed with water in a natural state, such as that of the sea, a river, lake, pond, etc. The fish's *gills* are its lungs, and with their aid it extracts from the air in the water the oxygen, or life-giving gas, which is necessary to purify the blood and to support life. If water be boiled, all the air mixed with it is driven off along with the steam, and a fish placed in this water dies rapidly of suffocation, just as a lung-breathing animal dies if placed in the water. Fishes generally rest with their heads up the stream, so that a fish need only open its mouth and the water pours in. It does not swallow this water, but lets it pass through the *gills* and out at the two slits, one on each side of its head, formed by the *gill-covers*. These gill-covers, which protect the gills, are two thin plates of tough skin, which rise and fall every time the fish gulps down the water. Under them lie the gills themselves, which are generally red, and consist of a number of beautiful fringed or feathered membranes, or thin skins, gathered up into folds, and looking very much like combs. There are usually four rows of these membranes at each side of the head, but there may be fewer. If the gills are not kept moist they cannot act, so that when a fish is taken out of the water its gills dry up and it dies from suffocation, because it cannot take oxygen direct from the air, but only from air mixed with water.

"The *heart*, which is very small, is situated just behind the head—almost under the chin, we should say. It has two

cavities—an *auricle*, which receives impure blood from the veins after it has circulated through different parts of the body; and a *ventricle*, which receives the blood from the auricle, and then sends it to the gills. As the water passes into the fish's mouth and out again through the gills, the air in it is taken up by the bloodvessels in the fringes of the gills, and being thus purified it then passes into other veins, and so all through the body.

"Fishes (as well as Amphibians and Reptiles) are called *cold-blooded animals*. Their ordinary temperature is far below that of our bodies, so that if a fish be taken into the hand it feels cold. Only a comparatively small amount of oxygen is absorbed by the gills of a fish, so there is consequently little 'oxidation' or 'combustion' in its tissues, and therefore a very small amount of heat is generated.

"The temperature of cold-blooded animals is largely affected by the temperature of the medium in which they live. In warm-blooded animals this is not the case. The temperature of an Eskimo in the North is almost the same as that of a negro at the Equator. In the case of the former, the cold of the atmosphere is counterbalanced by a quicker oxidation, and therefore a greater generation of heat in the body, and by warm clothing.

"*Weight in Water and Out.*—Most fishes have inside them an *air-bladder* or *swimming-bladder*, which helps them to float near the surface of the water, or to swim lower down. Their bodies are nearly the same weight (bulk for bulk) as the water in which they live, so that they can move in it with great ease. If a fish be carefully weighed, and then put into a vessel full of water, the water will overflow, and if this overflow be carefully weighed also, it will be found that the weight of the fish and the water it displaces are very nearly equal. Now, air is much lighter than water. When a fish wants to *rise to the surface*, it puffs out or fills its swimming-bladder with air until its body is lighter than an equal bulk of water, and it then rises upwards. If the fish wants to *sink* or go lower, it presses out the air in this bladder by means of certain muscles, and, as its body then becomes rather heavier than an equal bulk of water, it slowly sinks: in fact, it can regulate its air-bladder so

as to poise at any depth in the water. Some fishes which live at the bottom of the deep water, and never come to the surface have no swimming-bladder, but most fishes that swim near the surface—such as the Haddock, Cod, Herring, Trout, Salmon, etc.—possess this curious organ. The swimming-bladder lies just in front of the vertebral column.

“*Food, etc.*—The digestive organs of a fish are very simple, and most, if not all, have a distinct stomach. Most fishes are provided with teeth, but these are usually very small, and only adapted for seizing and holding their prey; they have no means of masticating their food. Fishes' mouths differ considerably from each other: in some the teeth are almost entirely absent; some have sharp teeth for cutting (such as the Shark and Pike), some blunt teeth for grinding (such as the Tench), and some for tearing (as the Salmon and Trout). Fishes live chiefly on animal foods—such as worms, snails, crabs, lobsters, water-beetles, flies, etc.—and many of the larger fish prey on little fishes. Many fishes swallow their food alive, and some tear it up before swallowing. Some fishes have no tongue, and where there is a tongue it is usually small.

“*Covering.*—As the fish is cold-blooded, it does not require a special covering to keep it warm, but the outer covering of its body serves to protect it from harm. In some fishes the surface is a thick skin, but generally it is a covering of *overlapping scales*. The scales of fish differ very much in form: sometimes they are of a square shape, sometimes rounded on two edges (as in the Cod and Haddock), and frequently almost round (as in the Herring). These scales extend from the eye to the tail on each side of the body, and are often of different colours on the back and centre of the body to what they are under the body. They are formed of a horny or bony substance, similar to the hair and nails of a human being, and are arranged in a manner similar to the feathers of a bird—*i.e.*, they overlap each other—and are rooted to the skin in such a way that, when the hand is passed from the head to the tail, the surface seems smooth; but the scales feel rough when the hand is passed from the tail to the head—*i.e.*, they are like the tiles of a roof, which overlap,

and prevent water getting through between them. This scaly covering is flexible, because each scale is separate from its neighbour, and therefore the fish is able to bend its body with perfect ease. To prevent the water getting between the scales, a coating of slime oozes out under many of the scales from pores in the skin.

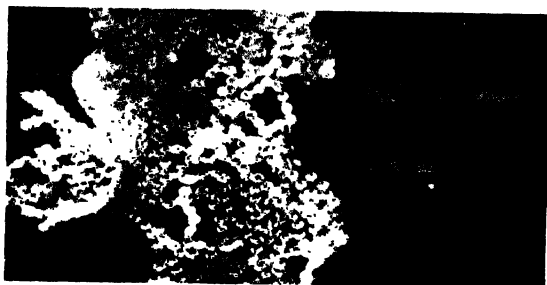
*"Shape and Movements.*—The 'spindle shape,' which is more or less characteristic of fishes, is just that form which enables the creature to glide through the water with ease and swiftness.

"The tail and fins of the fish assist it in swimming; the former acts like an oar in 'sculling' on the sea. The fish darts through the water by making powerful strokes with its tail from one side to the other, and bending the body in the same direction as the tail. A fish, therefore, swims chiefly with its tail; the fins assist it in steering or directing itself. As all backboned *animals* have four limbs corresponding to the two arms and the two legs of a man (though these are very much modified or altered to suit different purposes), so the fish has its limbs. There are four fins, which correspond to our four limbs, and these are always found in pairs. The *pectoral fins*, or 'arm fins,' are on the right and left sides of the breast, just below the gill-cover; the two 'leg fins,' or *pelvic fins*, are underneath the body farther back.

"The fins on the back are called the *dorsal fins*, and the one fin underneath the body near the tail is called the *anal fin*, while the tail fin is often called the *caudal fin*. When a fish wants to go to the *left*, it twists its body and strikes the tail to the right, at the same time moving its right pectoral fin like a fan, and keeping the one at the left close to its side. If it wants to go to the *right*, it strikes the tail and body in the opposite direction, and moves the other fin. The dorsal and anal fins help to keep the body upright. Most fishes have all the fins here mentioned, but they differ in size and shape, and sometimes in number, in different fishes. The fins along the back and the stomach are especially useful in keeping the body upright. When a fish is weak or ill, it drifts helplessly about on one side, or floats on the top of the water, because it has not strength to steer and balance itself, or to use its swimming-bladder.



PLATE LIX



SLAWN OF PERCH



PERCH



PIKE OR RUFF

"Fishes that are not great swimmers—such as Eels and some of the Flat Fish—have only very small fins; but in the Eel there is a long narrow ridge of continuous fin from the head to the tail, and the anal fin is also joined to the tail. Most fishes swim very fast; the Salmon can go from twenty to twenty-five miles an hour, or as fast as a steamboat.

"*The Senses*.—Fishes appear to have all the *five senses*, but probably the senses of taste and touch are only very dull. They can also hear, but the ear is very difficult to find in most fishes. Their eyes are generally very large, and their sight is sharp, but the eyes are so constructed that they would be of no use on land; some fish which live in the mud or in dark caves have no eyes at all. The sense of smell is very slight.

"*The Egg*.—Fishes (with one or two exceptions of tropical fishes) are hatched from eggs, which are laid by the parent in very large number. These eggs are called *spawn*, and, according to the kind of fish, are laid in different places—sometimes on the leaves of water-plants, or on seaweed; sometimes at the bottom of a stream, on sand or gravel, or in shallow water along the coast. Some fishes, such as the Sturgeon and the Salmon, ascend the river at the time of 'spawning'—*i.e.*, when they lay their eggs—whilst others, like the Eel, descend to the sea to lay their eggs. Fishes take very little care of their eggs, but leave them to be hatched by the warmth of the water. The number of eggs laid is immense; thus, a Herring will lay many thousands in a year, and the Cod several millions, but the Shark only lays two eggs in a season. Immense quantities of the eggs are devoured by fish, as well as by birds and reptiles. In the case of the Trout and the Salmon, the spawn is laid in the Autumn of the year in a little trench in the sand, which the female scoops out with her tail. She then covers the eggs with gravel, and they lie there during the winter, to be hatched out in March or April."

We may now briefly enumerate a few of the better known fresh-water fishes, and give some information concerning them likely to be of service. This brings us to the first family upon the British list—namely, the Perches, and of these we may deal



with two representatives—namely, the Perch and the Pope, or Ruff.

**Perch.**—As an angler, I always regard this fine sporting fish with appreciation, for it recalls many happy days spent in the open air circumventing the wily fin-folk of our fresh-water lakes and streams. In some ponds this is a very common inhabitant, and I have known fifty or more caught with rod and line during an afternoon. I have taken this fish up to  $3\frac{1}{2}$  to 4 pounds in weight, and although it attains a weight of 7 or 8 pounds, a fish of the size I have indicated may be regarded as a fine capture. When I was staying at the White Horse Hotel, Ipswich, a few months ago, I noticed a very fine specimen mounted, which weighed 3 pounds and 14 ounces. I have much regard for the accuracy of Mr. Aflalo's writings, but must take exception to his statement that "Anglers are at all times careful not to prick and lose a Perch, as the rest of the shoal are easily frightened away." My experience has been quite the reverse, for I have pricked dozens of Perch, and never knew them to be frightened away. Rather I have admired their persistent pertinacity, and have often caught a large Perch in which a hook had previously been lost, thus proving that the pricking makes precious little difference to this voracious feeder. My father, an angler of over forty years' experience, and my grandfather, of over fifty years' experience of angling, both bear me out in this statement. The Perch is a remarkable fish as regards its appetite and its aspirations when feeding, for I have times out of number caught small individuals very much less in length than the lobworm they had taken. They have enormous mouths, and take the bait right down.

These are gregarious fish, and if the angler can light on a Perch hole and get the fish "on the feed," he will have his time fully occupied. My father was always an authority on these Perch habitats. Although perhaps the water being fished was strange to him, and whilst I, in my youthful innocence, had rushed up and down stream or careered all round the lake, he had found a likely "spot" for his favourite fish, and his creel at the end of the day had borne ample testimony to his

cunning, many fine specimens of 2 and 3 and  $3\frac{1}{2}$  pounds weight having been taken.

It feeds, so it is said, on young Moorhens, Water Voles, and Reptiles. Whilst it undoubtedly does subsist largely on insects, Minnows, young Roach and Dace, etc., it seems to me rather a tall story that it partakes of the first-mentioned dietary. It spawns among the reeds in May, and our photograph will convey an admirable idea of what this is like. It is a beautiful fish, and is characterised by the prominent front dorsal fin, which is exceedingly prickly. It also has five or more black bands on the side of the body. This latter is bronze or green on the back and sides; whitish underneath; red fins. When swimming in clear water it presents a beautiful appearance, and I have noticed that if the fish are on the feed it does not make the slightest difference if the water is gin-bright—they may easily be captured. Whilst mostly restricted to ponds, lakes and the like, Mr. Aflalo states that he has caught large specimens in the Baltic three or four miles out at sea.

The Bass, which affords so much sport to sea anglers, is a relative of the Perch, and is also found in brackish and even fresh water.

**Pope, or Ruff.**—I have found this little fish exceedingly common in canals, where the boys, for some reason best known to themselves, call it the Daddy Ruff. Nearly related to the Perch, it is, as might be expected, a voracious feeder, and affords an amount of sport to young disciples of Izaak Walton. It may be at once distinguished from a small Perch by the possession of one dorsal fin instead of two, and in place of the black bands the body is spotted. The spawning season is early in the Spring, and the fish should be sought for in those rivers having a muddy bottom. This probably accounts for its preference for our canals, which, when drained, have a huge accumulation of mud in the bed.

**Miller's Thumb.**—This little species belongs to the Bull-heads, the only British fresh-water representative of an interesting family. I remember this fish as a special favourite in my boyhood days, and the many happy times I spent wading in a clear running stream contriving to detach the wary little

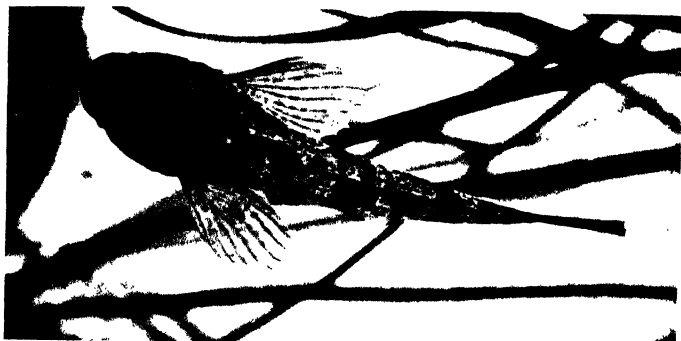
creature as it hid its body under a stone. I did not, at any rate, resort to the practice of striking the stone sharply and so stunning the fish, a favourite, but to my mind a cruel, method of dislodging it mentioned by Mr. Aflalo.

It is greenish on the upper parts, lighter on the sides and belly, with vertical black bands. It is almost scaleless. It possesses spines upon the head, which undoubtedly protect it from the ravages of various aquatic birds. Beyond this, the Miller's Thumb has the habit of inflating its head when a bird attempts to swallow it. The food mostly consists of various larvæ.

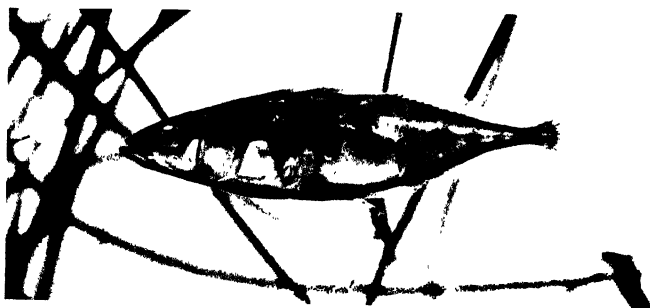
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We must of necessity pass by several families of sea fish, such as the Sea Breams, the Gurnards, the Weevers, the members of the Mackerel family, the Horse Mackerels and their allies, the Garfish and Flying Fish, the Gobies and Suckers, the Blennies and Band Fishes, and the Atherines and Grey Mulletts. None of these frequent fresh water excepting the Grey or Thin-Lipped Mullet. This species does wander up some of our rivers, and the Sussex Arun may be mentioned in this respect. It is a silvery fish, banded with a dark colour, and when living has a beautiful lustre. This, however, is soon lost after death. We now reach the Sticklebacks, three species of which claim attention—namely, the Three-Spined, Ten-Spined, and Fifteen-Spined. We will take them in the order given.

**Three-Spined Stickleback.**—This common inhabitant of our streams and brooks is a really wonderful little fish, and its life-history would amply repay observation. The most interesting characteristic is the manner in which the bright little male Stickleback—called a "Soldier" by the juvenile fraternity—jealously guards the "nest." To those unacquainted with these fish it will doubtless come as a surprise to know that a nest is constructed: such, however, is the case. Search should be made during the late Spring or early Summer in some clear running brook or stream, and there it is most likely the male will be seen guarding the entrance to its home. He is the proud possessor of the homestead, and although he permits females to enter within the portals for the purpose of depositing



MILLER'S THUMB



THREE-SPINED STICKLEBACK



GUDGEON



eggs, no male is permitted to explore the neighbourhood of the nest. The male is adorned with patches of red at this important season, and his little green eyes shine brilliantly as he excitedly pursues any unwary creature who comes too close to the citadel. The nest is usually well hidden, and needs careful searching for. Fish, as a general rule, lay an enormous number of eggs, and take no heed of them when deposited. An exception must, therefore, be made in the case of these Sticklebacks, which thus supply us with an interesting object lesson. It is remarkable to observe a female Stickleback with her belly bulging out with the quantity of ova, or eggs, that she carries, attended as she often is by quite a regiment of "Soldiers," each one endeavouring to entice her into a nest. They line up on each side of her, and the poor distracted female does not appear to know which way to turn, for she must of necessity disappoint several individuals eventually. I have watched the inhabitants of a little brook where these Sticklebacks nest every year with great interest, and it is astonishing the amount of aquatic life that may be seen when one uses his eyes to advantage. Caddis Fly larvæ, Water Scorpions, Water Boatmen, Whirligig Beetles, Pond Skaters, Fresh-Water Shrimps, Dragon Fly larvæ, and many microscopic forms of life, abound, and several pleasant and profitable hours may be spent as a direct result of being attracted by the courtship habits of the Stickleback.

The Three-Spined species is ill-named, as it sometimes bears four spines instead of three. The body is covered with bony plates instead of scales, and these, as with the spines, vary in number. The body is greenish, silver, and brown, excepting in the male when, as already stated, he is adorned with red at the breeding season. These fish can exist in either fresh or salt water.

**Ten-Spined Stickleback.**—This is a widely distributed species, but is not so common as the last. It does not possess any bony plates on the sides of the body, and by this means may be identified, as well as, of course, by the larger number of spines. The colour is greenish-brown, spotted with black; silver on belly and sides. Curious to relate, the male

of this Stickleback changes to deep black in the breeding season.

**Fifteen-Spined Stickleback.**—This species is olive in colour, patched with white. Like the others, it is an excitable little creature, and is stated to have the power of changing colour when in this condition. Whilst it is generally considered as a marine form, it resorts to fresh waters on the Continent, and may have been overlooked in this country. A sharp look-out should, therefore, be kept for it in our rivers and streams. It may be identified by the fifteen spines that it bears, as well as by the long body and snout and the large size. In a similar way to its relatives, it is polygamous, and jealously guards the nest, which in the sea is made up of seaweeds. Much has to be learned concerning these fishes, and the young naturalist would do well to carefully study them in a living condition, and endeavour to collect together further information of a useful nature.

We now pass by the Wrasses, the useful members of the Cod family, the Sand Eels, the important Flat Fish, and sandwiched between the latter and the Herring family, and before coming to the Carp family, we may consider the Fresh-Water Eel.

**Fresh-Water Eel.**—Unless kept in an aquarium, it is a difficult matter to make any detailed observation upon most of our fishes. Anglers, however, have many opportunities of noting some parts of a fish's history, and if fishing be unattended by cruelty, I should like every young naturalist to become a fisherman. I have, as a result of many years' angling, learned a good deal about the general forms and habits of several of our fresh-water fishes, and although I fish no longer, I am bound to admit one of the pleasantest and most instructive recreations has come to an end. I have an undecided opinion concerning the so-called cruelty involved in fishing. Of fishing with *live bait* of any kind, however, I have to-day, strange to relate, a distinct abhorrence! The mention of the Eel led me to write this, for I have been on intimate terms of acquaintance with this fish on many occasions. The slippery nature of the Eel's body is caused by the very small

scales with which it is clothed, and only those who have tried to hold one can appreciate what a difficult matter it is to obtain a secure grasp. In colour it is brown or green above, with white or yellow below. The eyes are small, so also are the teeth, but these are very sharp. The female is larger than the male. I have caught them up to 3 feet in length. The male does not attain a greater length than about 20 inches.

In Autumn the female Eels leave their fresh-water homes and descend to the sea for spawning purposes. After this important operation is at an end the fish dies, the specimens seen ascending our rivers in the Winter being young Eels, or Elvers. It is stated, and I believe with truth, that these young Eels cross damp fields in their migration movements, and a friend tells me he has seen them climbing the hills surrounding a Scottish burn. In view of the isolated ponds in which Eels are found, there seems a good deal of truth in this statement; but, if this is so, how do the adult females found in these isolated ponds get to the sea for spawning purposes in the Autumn, when there is no means of direct communication with the sea? Do they also travel partly overland to some river, or do they stay where they are, stranded, as it were, and do not spawn? Eels are slow growers, and it takes some years before an Elver becomes adult. They dearly love the mud, and here they should be sought for by the patient angler who delights in going a-fishing. They feed best—so my experience teaches me—on a thundery, unsettled day. It needs strong tackle to hold a good specimen, and the curious writhing and snake-like action of the body in the water makes the capture by no means easy. The young are very thread-like when they first appear, and I have known the female to spawn and the young to be produced in fresh water. This is a most uncommon occurrence. I have found a large Lobworm to be a favourite bait for this species, and on one occasion caught two large females, each measuring exactly 3 feet long, within five minutes of one another.

The tenacity of these fish is remarkable, and I have known them to live for a day or more out of water. Other specimens that have fallen to my rod have contrived to wriggle a con-



siderable distance through the grass towards the water, and sometimes I have only just been able to prevent my prize from slipping back into its natural element again quite unnoticed. When the migration fever is at its height in the Autumn many fine specimens are captured in sluice-gates by millers, water-keepers, and others, for the flesh is much esteemed by many people, and a fair-sized Eel makes, so I am told, a dainty dish. Although I have captured a large number, I could never fancy eating them, but have always found persons ready to receive them.

### The Carp Family

Of the various species of fresh-water fishes with which we are concerned in this part of our work no less than fourteen belong to this important family. These are all known as "Coarse Fish," and whilst some of them, such as the Gudgeon, Roach, Rudd, Chub, Dace, Minnow, and Bream, are found in rivers, streams, and lakes, several inhabit ponds, lakes, and other sheets of water that are completely isolated, and have no outlet excepting in time of flood. There are several ponds known to me where one would hardly expect to find any fish, but which simply teem with young Carp, Tench, Dace, and Roach. It has often struck me as remarkable how some of these fish became inhabitants of these isolated ponds unless they were introduced through human agency, or were carried thither when the floods were out. This opens up an interesting question. I know, for instance, what was once a famous Coarse-fishing lake, which was the habitat of a large shoal of some tremendous Bream, and which is flooded for some acres every season. There is a river a few hundred yards away, and when the floods are well out the lake and the river are joined together, often for days at a stretch. Yet, although I fished in *the river* for some years, and many others whom I have known, we have never taken a Bream there. Other kinds of fish inhabiting this lake are caught in the river after a flood, and at no other time, but the Bream is an exception. This latter fish, moreover, I have nearly always observed near the surface of the water. It seems,

therefore, that this species does not stray far away from its old haunts during flood-time, or if it does it gradually works back to the deep waters of the lake as the flood-water subsides. We may now set out the chief characteristics of this numerous family, and this brings us to the Carp.

**Carp.**—This fish was introduced into this country some 200 years ago. It thrives tremendously in many ponds and rivers, and lives to a great age. George I. placed some in the Long Water at Hampton Court, and when this was cleaned out, not a long time since, a specimen was found which was believed to be one of those salved from the water 130 years ago, when the Long Water was last cleared. The fish was certainly of great age, as could be told from the greyness of the scales. The average weight of a Carp up to about six years of age seems to be from 4 to 10 pounds, but a specimen of 14 pounds was captured at Hampton Court, one of 19½ pounds caught in the canal at Addlestone in 1907, whilst the largest specimen ever recorded in England weighed 24 pounds. The Carp is green to bronze in colour; the scales are margined with black, and the fins are reflected with yellow and violet. The colour, however, varies, and whilst I have caught specimens in small ponds of a very dark hue, others have fallen to my rod of the most beautiful bronze colour imaginable.

This fish possesses four barbels, two on each jaw. It feeds mostly on vegetable matter, but is also insectivorous. It breeds during the Summer, and produces a large number of small green eggs, as many as 750,000 having been taken from a fish weighing only 10 pounds. This species interbreeds freely with the Crucian Carp and the Barbel.

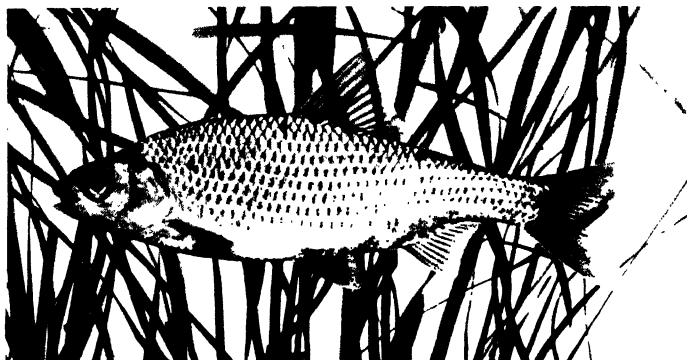
**Crucian Carp.**—This Carp may be distinguished by its much smaller size, and it does not possess barbels on the jaws. Many small ponds known to me contain a large number of these fish, but they do not seem to attain any size, perhaps owing to the limited food-supply and the absence of fresh water. In some of our rivers, however, it thrives well, but rarely exceeds 1½ pounds in weight. It is greenish on the upper parts, and bronze on the sides. It is a deeper fish in comparison to its length than its larger relative last described.

The so-called "Gold Fish," or Golden Carp, was introduced originally from the East, and although mostly kept in glass bowls, aquariums, and ornamental waters, thrives fairly well in some of our waters where they have been placed.

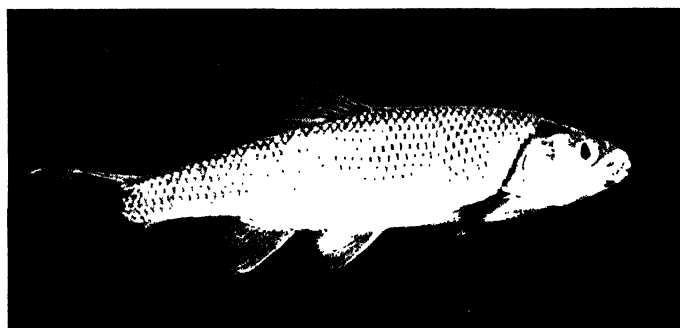
**Barbel.**—This species is restricted to England, and does not occur in either Ireland or Scotland. It is common in the Thames. It attains a weight of about 15 pounds, bears four prominent barbels, has a long and fleshy snout, and a thick upper lip. The general colour is green above and white below; the lower fins are red. It lives both upon animal and vegetable food. The spawning season is early Summer. It is a tenacious species, and in this way resembles the Carp.

**Gudgeon.**—A typical bottom-loving fish, the Gudgeon is a gregarious species, and in many of our rivers and streams is exceedingly common. It is a very small fish, and although I have on occasions seen some fine specimens, a limit weight of  $\frac{1}{2}$  pound may be given. It is greyish in colour, marked with dark blotches. It only possesses two barbels. It spawns in June. It is an insectivorous fish, and I have found it extremely fond of the larva of the Caddis Fly. In its feeding habits it is a most curious species. Often and often I have permitted my bait to drag right over a shoal of Gudgeon without the slightest effect upon the fish. Then, suddenly and without any warning, they have commenced to feed, and I have caught a large number in a short time.

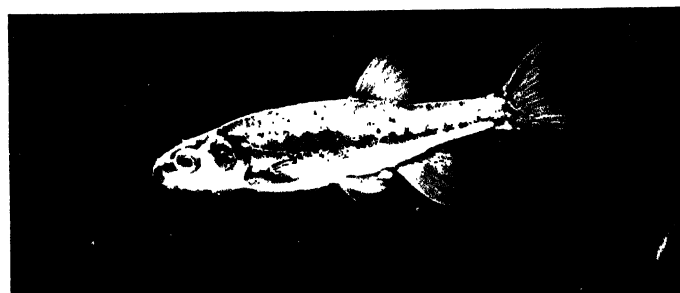
**Roach.**—This is a very favourite fish with anglers. It is common in lakes and rivers, but seems to me to afford more sport when caught in the latter. It feeds frequently, and affords fair sport to the angler. A favourite habit is to bait a well-known "Roach-swim" over night, so as to bring the fish on the feed on the keenly-anticipated morrow. It is a fine fish, and many large specimens have been captured by me which turned the scale at over 2 pounds. Whilst it attains a weight of 3 pounds, a specimen weighing anything over 1 pound may be regarded as a prize. Two specimens caught in the Sussex Arun at Amberley in 1907 weighed 2 pounds 9 ounces and 2 pounds 8 $\frac{1}{2}$  ounces respectively. The Roach is dark blue or green above; lighter colour on the sides; silver



ROACH



DACE



MINNOW

*PLATE LXII*



TENCH



BLEAK



RAINBOW TROUT



below; lower fins red. It feeds upon insects, molluscs, and some vegetable matter.

**Rudd.**—This is a really beautiful fish, and in some preserved waters in which I have angled since boyhood is very common, and attains a large size. I have seen my grandfather catch some tremendous specimens by fishing with bread and without a float, the bait being taken as it was floating on the water. It is a very deep fish, and although I have not the actual measurements by me, I am not far out when I state that I have seen specimens at least  $6\frac{1}{2}$  to 7 inches in depth, and weighing at least 3 pounds. Whilst it may be confused with the Roach, there are several distinguishing features that may be mentioned. The dorsal fin is nearer the tail, there is more red about the eyes and fins, the upper lip is horny and rigid, and my experience teaches me that the Rudd has more bronze than silver. It feeds on insects.

**Chub.**—I have found this to be a particularly wary fish, and not nearly so frequently distributed as the species we have recently been considering. Nevertheless, it is a common inhabitant of our rivers, appears in Scotland, and is said to be absent from Ireland. It has a broad pinkish-coloured head; the back is dark green, red near the fins, and white below. It attains a weight of about 7 pounds, but a fish half that weight may be regarded as a good capture. It spawns in the early Summer, and feeds on animal food, such as Frogs, Water Voles, small fishes, and Crayfish.

**Dace.**—This long-bodied fish is mostly found in running water, but not exclusively. It does not occur in Scotland or Ireland. It rarely exceeds more than 1 pound in weight, but a magnificent specimen weighing 1 pound 6 ounces was taken in the Thames in 1907. This is one of the largest Dace known. In colour it is silvery blue almost entirely throughout. It feeds on insects and vegetable matter, and spawns in May or June.

**Minnow.**—This beautiful little fish averages about 4 inches in length, but extra fine specimens of 6 or 7 inches have come under my notice. It is a common species, but seems to thrive best in a fast, clear running stream. It is a most voracious feeder, and it is possible to catch a large number with rod and

line when the fish are "on the feed," and that, according to my experience, is of frequent occurrence. The Minnow is dark green, patched with black along the lateral line. The fins on the breast have a red tinge. This species, however, has the power of changing its colour rapidly, which, according to Seeley, is due to "two layers of superimposed pigment cells that lie just beneath the skin." This fish is gregarious, and wanders about in large shoals.

**Tench.**—A lover of mud, the Tench may be sought for in ponds and lakes having no outlet. Here it thrives well, and specimens turning the scale at between 3 and 4 pounds have often had an honoured place in my creel. A friend of mine once caught two dozen of these fish before breakfast, which averaged over 3 pounds each. When taken from stagnant water the Tench is dark green to brownish, and whitish underneath. When placed in running water, however, its beauty is considerably enhanced. It has very small scales, and is very slippery to the touch. It possesses small barbels situate at the corners of the mouth; the dorsal fin does not bear any spines, the lips are flesh-like, and the tail fin is large and unforked. It lives for some time out of water, being very tenacious. The food consists of insects, aquatic herbage, and mud. It spawns all through the Summer.

**Bream.**—In many rivers, lakes, and broads this is a most prolific species, and years ago, when fishing on the Norfolk Broads, I remember we caught boatloads almost daily, all averaging a fair size. The Bream, however, affords very little sport, and is to my mind hardly worth fishing for. It takes the bait in a curious way, and this has a peculiar effect upon the float. When it has taken the bait the fish rises, with the result that the float falls over flat upon the water. Then is the time to "strike."

I have seen large specimens of this fish, that must have weighed from 7 to 10 pounds, sunning themselves at the surface of a Hertfordshire lake. They were literally black and blackish-grey with age, and have been inhabitants of the lake to my knowledge for over thirty years. I often tried very hard to catch them, but never succeeded, excepting on one occasion.

Even then it was a small specimen of about 2 pounds. It is a deep, flat fish, silvery in colour, with a red tinge upon the fins. The lower lobe of the tail is somewhat longer than the upper lobe. The food consists of insects and worms. Coarse fish generally are not highly regarded for the purposes of food, having a distinctly muddy taste. The Bream is perhaps the poorest of them all.

**White Bream.**—This Bream may be identified by the possession of more red on the body and fins. It also has a shorter anal fin, the lobes of the tail are equal, the scales are larger, and the fish does not attain a greater weight than 1 pound. It is a solitary species.

**Bleak.**—This species does not attain a greater length than 7 inches. It is a common inhabitant of many of our rivers and still waters, but does not occur in Scotland or Ireland. It is blue on the back and sides, with silver underneath. From the scales artificial pearls are manufactured, as referred to in our introductory pages. It is a surface feeder, and lives on insects.

**Loach.**—The last member of the Carp family upon our list, the Loach, is a small mud-loving fish of about 4 inches in length. It has six barbels, all situate upon the top jaw. It is dark green on the back, yellow on the sides, grey below, with spots and streaks of dark brown. Like the Miller's Thumb, this species loves to hide beneath stones, and is a very wary and difficult creature to catch. It is not tenacious, like the other members of its family, and soon expires when taken from the water. The diet is a differential one, and consists of worms, insects, spawn, and vegetable matter. The spawning season is March and April.

### The Salmon Family

**Salmon.**—This magnificent fish is both a fresh- and salt-water inhabitant. Unlike the Eel, the Salmon comes into our fresh-water rivers, such as the Severn, the Avon, the Tay, and the Shannon, for the purposes of spawning. The Eel, as has been shown, goes to the sea to carry out this important operation. Like some kinds of birds, it is stated that this, the



"king of fishes," will return to the same river, and some state that the females lead the way, followed by the males, and then the young. The spawn is deposited late in the year in a heap of gravel, and during the spawning time pitched battles are fought between the males. When ascending our rivers, it is of course essential that obstacles such as waterfalls should be successfully overcome. To accomplish this, the Salmon has the power of leaping out of the water a considerable height. Beyond this, on our chief Salmon rivers—some real, others so-called—ladders are placed to assist the fish in their movements.

The average weight may be given as between 20 and 40 pounds, but much larger specimens are recorded. Three remarkably fine specimens, of 62 pounds, 61½ pounds, and 50 pounds, were taken respectively in Norway, in the Tay, and in the Awe during the season 1907. The Tay fish was the largest Salmon caught there for over thirty years. According to *Country Life*, "H.M. Inspector of Fisheries for Scotland expresses in his annual report [for 1908] his belief that he is able to record a Salmon of 103 pounds as having been caught in the Forth, a few miles below Stirling, in 1901 or 1902. He remarks that 'no visible record of the fish was retained, since the possession of the fish was fraught with a certain amount of danger to the captors.' It is very annoying. Here is a salmon beating all previous weights by 19 pounds, and yet on such a meagre and belated evidence that it cannot be accepted as a record. There is no reason for doubting the possibility of a 100 pounds Scottish Salmon, but we must walk by sight, not by faith, when records are in question, or where should we be?"

Steel-blue may be given as the general colour of this species, spotted with black; but when the fish has been resident in fresh water for some time, reddish spots and lines appear, and the beautiful steel-blue becomes considerably dulled. It has hooked jaws, a small adipose fin on the back in close proximity to the tail, and pink-coloured flesh.

The fish, as is well known, affords great sport to anglers, and a large specimen requires careful and expert handling. In our fresh waters it is considered that the Salmon does not feed to any great extent; indeed, our knowledge of the food generally

is very limited. It suffers from parasites in the form of a fungus, and much mortality is noticeable after the first spawning season is at an end. The time occupied in spawning is from three to twelve days, and the season extends from the end of Autumn until Spring. After the laying of the eggs, both male and female fish return to the sea, or in many cases die. The young fish goes down to the sea in the first or second Spring after its birth, but little is known of its life there, except that it grows with great rapidity.

**Trout.**—There are a large number of species and varieties of this fish. The Common River Trout (known as *Salmo fario*) attains a weight of several pounds, and among the records before me are the following recent captures: A 17 pounds 4 ounces specimen taken by Mr. Edwards at Mucross, Lakes of Killarney, a 14½ pounds Trout which fell to the rod of Mr. Buckingham of the Gresham Angling Society, whilst fishing in Ireland. Another specimen was captured in the West of England by the Rev. S. E. V. Filleul which turned the scale at 12½ pounds, and was landed in a clothes-basket.

Mention must be made, however, of the very remarkable specimen captured by Mr. James Brigg of Harringay, towards the end of August, 1907. The fish was taken from the New River at Harringay, London, and weighed 18 pounds. It measured 2 feet 6 inches in length, and was 22 inches round the body. For over two years professional and amateur anglers had been tantalised by the sight of a monster Trout in the New River, which runs at the bottom of Mr. Brigg's garden. The fish was often tried for, but without success.

On August 28 Mr. Brigg determined once more to try and land the slippery Trout. He used an ordinary two-jointed sea rod, and baited his hook with a convenient worm dug up from the garden. After fishing for some little time he got a bite. It was the big trout, and he managed to land it after about three-quarters of an hour's struggle. The fish was stuffed by Mr. Gillett, the taxidermist, who considers it to be quite a hundred years old. In support of this theory he points out the horn-like growth on the bottom jaw, which takes many years to attain to any size.

In colour and size the Trout is subject to a good deal of variation, so much so that it is difficult to tell which is a species and which a variety only. A general colour may be mentioned of green or brown, spotted with black or red. Some specimens have fallen a prey to my rod almost black in colour, whilst others have been of a bronze-brown, and others again silvery and pink and beautifully spotted with red. The latter is a remarkably beautiful fish. It is a voracious feeder and dearly loves a Lobworm. The usual and more sporting method of luring this fish is by means of fly-fishing, and bottom angling is prohibited in most Trout streams. So deadly are Lobworms that I have caught two dozen Trout averaging 2 pounds each in weight during a few hours' fishing. This is a splendid sporting fish, and in a fast-running stream requires a good deal of landing. It feeds upon insects, fresh-water Shrimps, Snails, and small fishes, and loves to partake of the May-Flies as they rise during the Summer and pursue their zigzag pilgrimage down-stream.

It will be interesting to briefly set out the life-history of this fish from the time the egg is deposited until the Trout has celebrated its first yearly birthday. For this purpose we may again quote from Mr. Gardiner's leaflet on Fish-Life, already referred to at the commencement of this chapter.

In the first place, we see the ovum about the size of a pea, yellowish in colour, with the red eye-spot of yolk standing out prominently among the mass of yellowish matter.

In from thirty to sixty days after the eggs are laid, according to the temperature of the water, they begin to show faint signs of life, and the eyes appear as small specks.

When the ovum is fully eyed, the only thing which, to the ordinary observer, shows that the egg has life in it is the still further development of the eyes.

When the ovum is hatching the young fish lies coiled up in the egg, which it finally bursts in its struggles to be free. The tail usually comes out first. If the head appears first (as it does sometimes), the fish has little chance of escaping from its enemies, who are watching in front to catch it, for it cannot dart away from them.

The young fish, now called an *Alevin*, soon after this bursts its way out of the egg, and issues with a conical bag suspended under the belly. This contains the red yolk of the egg, and forms the food which the fish feeds upon for the first few weeks of its life. The mouth is only very slightly developed, but the eyes are very perfect. The fish is very delicate and almost transparent.

About the seventh or eighth week the Alevin has changed into a well-formed little fish about an inch long, and it now begins to seek about for food with great activity.

The little fish grows apace, until when it is twelve months old, or a yearling, as it is called, it has become quite a nice little fish of about 3 inches in length.

It grows very rapidly when it has abundant food, and may live even thirty years or upwards.

**Grayling.**—Passing by the Char, a fish of somewhat nocturnal habits and an inhabitant of deep water; the Smelt, which ascends tidal rivers for the purpose of spawning; the Powan, which is found in several British Lakes; and the Pollan, which occurs in various waters in Ireland, we come to the Grayling.

This is a fine fish. It inhabits clear running streams, is solitary in its habits, and has a peculiar smell. The first dorsal fin is characterised by being many-rayed. This fish is a quick swimmer. It is generally pale brown in colour, silvery underneath, spotted with black on the head and body, and light on the fins. In the spawning season (April or May) the latter are banded with red. The food consists of small fishes and molluscs. A weight of about 4 pounds is attained, and among our more famous Grayling rivers may be mentioned the Severn, Trent, Teme, Wye and Ouse (Yorks).

**Pike.**—This brings us to the last fresh-water fish with which we set ourselves out to treat, and this is no less a personage than the voracious Pike, aptly termed the fresh-water Shark. This is a wonderful species, and appears to thrive equally well in both running and still water. It attains a very heavy weight, and I have seen specimens which turned the scale at over 50 pounds. Two fish caught in 1907, weighing

29 pounds and 34 pounds, and taken from the Thames at Oxford and in a Wiltshire lake respectively, may be regarded as very fine fish. In a Bedfordshire lake where I have caught many Pike I have seen one taken that weighed 38 pounds. With regard to this particular sheet of water an interesting story may be narrated. The lake was drained, and *tons* of coarse fish taken out, such as Pike, Perch, Carp, Roach, Rudd, Dace, Eels, etc., to make way for some Rainbow Trout. Eleven thousand of the latter were placed in the water, but as they did not appear to be thriving very well, in a few months' time the lake was netted again. It says much for the vigour and voracity of the few Pike which escaped being enmeshed on the previous occasion that only 9 of the 11,000 Trout were found, the rest having disappeared in order to satisfy the greedy appetites of the hungry Pike! It would be interesting to see the few Pike that remained in the water after their feast upon 11,000 young Rainbow Trout.

As regards food generally, this fish is in no way particular. It will take fish of all kinds, as well as insects, birds, such as Moorhens, Wild Duck, Coots, and Little Grebes, also Water Voles and Frogs. I knew of one monster which made a grab at the head of a large Swan. The result was that both the bird and the fish suffered death, for the head of the Swan choked the voracious Pike, and the bird was unable to extricate its head from its fatal position. The Pike is a cannibal as well, and will devour its own kind without ceremony.

It loves to bask at the surface of the water, and is a wary, artful, and sagacious species, exhibiting many interesting ways. It darts with swiftness and celerity through the water, and is a splendid fighter for liberty when caught with rod and line. I remember landing with immense satisfaction a specimen of 13 pounds some few years ago at the Bedfordshire lake already mentioned. So ravenous are these fish when upon the feed that the same individual will take the bait time after time, and I have frequently lost a specimen only to catch him again later on, with my lost hooks firmly riveted in his mouth. The teeth are small, but very sharp, and care should be taken when a freshly caught specimen

is being handled. This is a strong species, and even when it has been out of the water some time is found to be very tenacious.

It is dark brown to green on the upper parts, darker along the back, but lighter on the sides, and white beneath. The beauty lies, however, in the yellow spots and bands upon the sides, which give the fish a very handsome appearance. It is a solitary species, a predatory creature, and one of the chief inhabitants of our waters, its very shadow often filling the heart of a young fish with terror.

## PART II

# BRITISH INVERTEBRATES

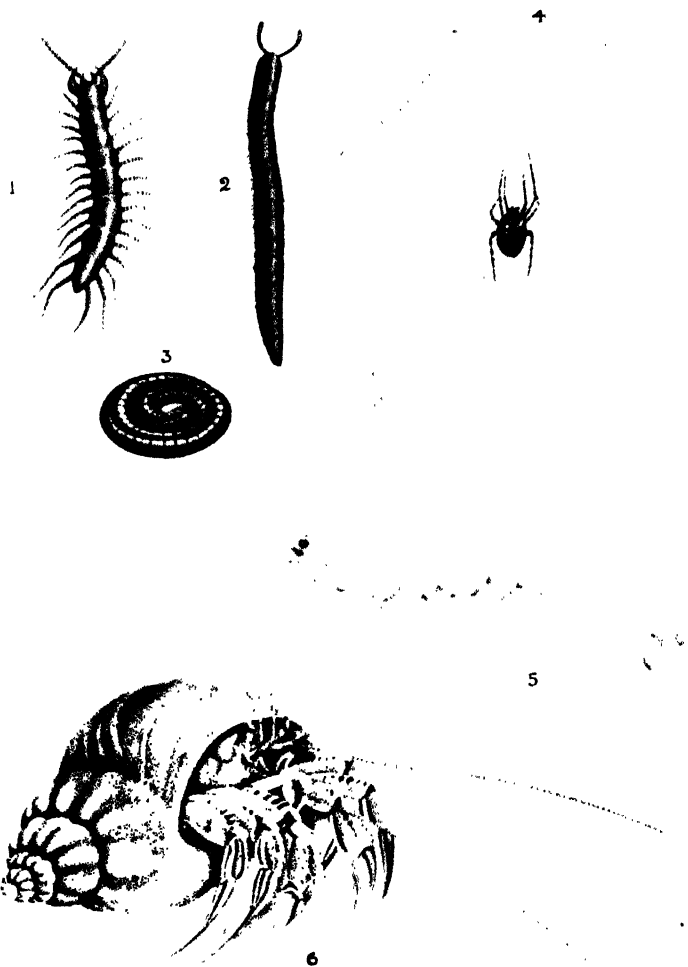
### CHAPTER VI

#### GROUP I.—ARTHROPODA, OR JOINTED ANIMALS

##### Class I.—CRUSTACEA (CRAYFISH, CRABS, LOBSTERS, Etc.)

HAVING surveyed a large number of the commoner British Vertebrates, commencing with the Mammals and finishing with the Fishes, we now come to the second part of our work—namely, the Invertebrates. You will have already learned that an invertebrate animal is one which does not possess a vertebra, or backbone. The first group of Invertebrates, then, with which we are concerned is the Arthropoda, or jointed-limbed animals. This large and important group embraces the Crabs, Lobsters, Shrimps, Spiders, Mites and Ticks, Centipedes, Millipedes, and Insects. For the purpose, however, of dividing up our work into the more important classes, we deal in this chapter with the Crustacea, the Arachnida, and the Myriapoda, and then devote a separate chapter to the Insects. These latter belong to the Arthropoda, or jointed-limbed animals, but are such a large and important class that it is essential they should be accorded an entirely distinct section.

Crustaceans form a large and important class of animals, many of them known by sight or name to most people, such as Crabs, Lobsters, Shrimps, etc. Most of them are aquatic in their habits, and either inhabit fresh or salt water, or reside



JOINTED ANIMALS

(for Details see over)



- 1 Centipede (*Lithobius forficatus*)
- 2 Millipede (*Illulus terrestris*)
- 3 Do. coiled
- 4 Common Cross Spider and Web (*Araneus madagascariensis*)
- 5 Common Prawn (*Decapoda*)
- 6 Hermit Crab (*Pagurus hermannius*)

in damp places. They breathe by means of gills, and even the Wood Louse, which is often erroneously considered as an insect, breathes in this way.

The name "Crustacea" is derived from the Latin *crusta* = a crust, meaning that all the creatures thus classed possess a *crusta*, or a more or less perfectly formed shell, as an outer covering. The form of the body exhibits considerable variation, and the crust, or outer covering, is often very hard and firm, as in the Crabs and Lobsters, and is shed periodically. These Crustaceans also exhibit keen powers of rivalry and fighting habits. They frequently lose their limbs when engaged in combat, but acquire new limbs to take the place of those that have been lost.

Most Crustaceans lay eggs, and the young of a large number of species pass through several stages before they reach the adult state. Whilst the food is a differential one when the whole group of these animals is considered, generally speaking the larger number feed upon dead creatures of various kinds, as well as waste organic matter. A few are, however, herbivorous, as we shall presently see. The jointed-limbed animals constitute a very large group, and these, again, are split up into a number of smaller ones. It will be sufficient for our present purpose, however, to separate them in the manner already indicated, and the young naturalist must of his own accord learn to classify and study special groups if he is so minded.

We may now proceed to give the chief features of a few typical examples.

**Brine Shrimp.**—The young naturalist who wishes to succeed in obtaining an intimate knowledge of many of the animals set out in this chapter, and also in Chapter VIII., must of necessity have opportunities for visiting the sea and seashore, and specialise in the fascinating branch of Marine Zoology. Many of my young readers will not have the facilities afforded of so doing, but a great many of our young people visit the seaside for their annual holidays. Then is a good time to observe many of the commoner forms of marine animals in a living condition, and even in a few days' sojourn a number of interesting first-hand observations may be made. Search should

therefore be made for the Brine Shrimp. This is a small animal, reddish in colour, about  $\frac{1}{2}$  inch in length. It will be found to possess no less than eleven pairs of legs, and should be compared with the real Shrimp. If this is done it will be noticed that it is broader and flatter in the front of its body than the Edible Shrimp, known to almost everyone, and the second half of its body consists of a jointed tail.

**Barnacles.**—These curious animals have doubtless attracted the attention of the young seashore naturalist. They were formerly (and still are by some writers) classified among the Mollusca, or Shellfish, but it is more correct to include them among the Crabs and Lobsters. They are attached to the sides of ships, piers, rocks, and other places, by means of their heads. When the feather-like feet are kept in constant motion they produce a current which carries small organisms to the mouth.

The species which the young naturalist is most likely to encounter is the Acorn Barnacle, which may be found on almost every rocky portion of our coast-line. This species is not supported by a "peduncle," or stalk, as is the case with the Goose Barnacle, that commonly attaches itself to ships' bottoms and floating wreckage. You will notice that the shell of the Acorn Barnacle is a sort of irregular cone. Within this the animal is lodged. Observe the slit in the "lid." By means of this the Barnacle is able to thrust out its six pairs of legs, and so obtain food in the manner described. The food chiefly consists of small animals and other marine creatures.

Mr. Alfonso Gardiner states that "the young Barnacles, when born, swim about freely, and are altogether unlike the adult creature, having three pairs of legs, and only one eye, with thin delicate shields on their backs. They moult several times, and at last settle down on some floating object by means of little suckers, which gradually become glued to the spot. Changes now take place, the shell is developed, and the perfect form assumed.

"Barnacles of one or other of the many species are found all over the world, and all are marine. Some are found as parasites growing on the Whale, others grow on the Turtle, and many forms are found living and floating about on ships and

timber. When a ship has to go into dock to be "scraped," the cleaning consists in scraping off the hundreds of thousands of Barnacles which have fixed themselves to the shell of the ship under water. The presence of all these creatures retards the progress of the vessel very much. To prevent their growth, as well as to strengthen the ship, wooden ships were copper-bottomed, as this tends to prevent the attachment and growth of Barnacles.

"The scientific name is from the Latin *lepas* = a limpet; from the Greek *lepas* = a bare rock."

**Wood Louse.**—Most people, both young and old, are acquainted with this interesting Crustacean, for such it is, and not an insect, as has already been mentioned. It frequents dark places; dearly loves to hide under pieces of bark, stones, and other similar situations. It travels very quickly; is well armoured in a strong coat of grey mail; has a jointed body, which enables the creature to roll up into a ball about the size of a pea for protective purposes, and thus reminds us of the Hedgehog. It bears many short jointed legs, and a jointed antennæ; in fact, the whole structure of the little animal seems made up of a series of joints. This animal is a land representative of a number of aquatic Wood Lice. A large marine species may be found in holes and crevices on a rocky shore. Wood Lice mostly feed on decaying vegetable matter.

**Shrimp.**—In Mr. Gardiner's booklet on "Marine Life," he has set out with commendable brevity the full life-history, form, and structure of a number of animals with whose character we are now concerned, and for a great deal of the information which follows I am largely indebted to him.

The Common Brown Shrimp prefers shallow water, and may be found in the little pools left by the receding tide along our coast. It is of a drab colour, dotted all over with brown spots, and does not become red as a result of being boiled, as most Crustaceans do. Its greatest length is about 2 inches, tapering, and arched as if hunchbacked. It is only after it is boiled that the tail curls under the body. The beak is very short, and this distinguishes it from the Prawn, which latter is much more like the Lobster.

The Shrimp is almost translucent when in the water, so that it readily escapes observation when swimming about, or when resting on a sandy bottom, which it most resembles in colour. When alarmed it buries itself in the sand, making a hole by means of its tail.

The Shrimp is largely used for food, and is generally caught in a net forming a kind of wide-mouthed bag stretched on a cross-beam at the end of a pole.

In order to escape their chief enemies, fish, Shrimps hide themselves during the day under stones or in the sand, but come forth at night to seek for food. It is probable they find their food by scent, for a blind Shrimp will find its food as easily as one with perfect sight.

The female Shrimp carries her eggs in a similar manner to the Lobster, and the young are born in the early Summer.

The scientific name is from the Greek *krangōn* = a shrimp or prawn, and Latin *vulgaris* = common.

**Common Prawn.**—The Common Prawn, which is both an article of food and is used for garnishing dishes for the table, is found in vast numbers in the South of England, and in many places also where Shrimps are located; in fact, in some parts of the country these creatures are called Shrimps. They are more like a Lobster than a Shrimp, and in some tropical countries the Prawn rivals the Lobster in size.

In its native haunts the Prawn is nearly invisible, being almost colourless and translucent, and marked merely with streaks of various very pale tints.

There are many species found in all parts of the world, except in the colder regions. They are very active, and exceedingly voracious.

"Prawn" is from the Old English *prane*, which is probably from the Latin *perna* = a sea-mussel.

The scientific name is from the Latin *palæmon*, and the Greek *Palaimōn* (*Palæmon* was the Roman name of a Greek god, Melicerta, who was friendly to shipwrecked mariners), and Latin *serratus* = serrated, saw-like, referring to the saw-like notches on the head.

**River Crayfish.**—The Crayfish, the Lobster, the Shrimp, and the Prawn, all belong to the "Long-Tailed" Decapods.

The Lobster is entirely aquatic, and all are furnished with a broad swimming tail at the end of the abdomen. The Fresh-water Crayfish is a common inhabitant of many of our rivers and streams, and a valuable illustration of this division of the Crustaceans. The shell, or "carapace," consists of two great parts—the head and thorax (almost in one, forming a rigid shield), and the abdomen or tail, consisting of six separate segments or rings, having a swimming tail at the end. There are four pairs of walking legs, in addition to the two claws.

The muscles are all well developed, the nervous system is very complete, the alimentary canal is very perfect, and the circulatory system consists of a dorsal heart, from whence the blood passes by arteries and capillaries to the body, and thence to the gills and back again to the heart. The respiratory system consists of twenty pairs of feathered gills under the great shield formed by the head and thorax.

The female lays eggs in November and December; these are fixed to the abdominal legs by a kind of glue, and are hatched out by May or June.

The young are very much like the adults. The young Crayfish moults about eight times in the first year, five times in the second, and twice in the third year of its life, and then once a year afterwards. The reason for the moulting of Crustaceans is the fact that the enclosing shell does not grow with the growth of the body.

The food of most Crayfish consists of dead animals, molluscs, worms, insects, and larvæ. The creatures usually feed at night, and lie at the mouths of their holes, or burrow in the sides of streams, watching for their prey. Crayfish are found in almost every part of the world, and nearly the whole of them are useful for food. Like Crabs, Lobsters, Shrimps, and Prawns, they all have to be cooked by boiling before being eaten, and in this process the colour changes from brown and black to light red.

The small spiny Lobster (*Palinurus vulgaris*) is often called the "Sea Crayfish," but it is really a Lobster.

The Crayfish probably lives from fifteen to twenty years.

The English name "Crayfish," sometimes incorrectly spelt "Crawfish," is from the Old English word *crevice*, which is from the Old French word *crevisse*, now *écrivisse*, the name for the creature. All these words are allied to the German *Krabbe* = a crab.

The scientific name is from the Greek *astakos* = a lobster, a crayfish, and Latin *fluvialilis* = pertaining to a river.

**Lobster.**—This Crustacean will be known to the reader, at any rate, in a boiled condition. It much resembles the Shrimp in general form, and the young naturalist would do well to make a detailed examination of the two creatures. It is, of course, much larger, has a pair of very large pincer-like claws in addition to the other legs, and long antennæ. Lobsters resort to holes in the rocks covered by the sea. When approached they dart rapidly backwards, leaving only the head and claws exposed. With these they protect themselves. The Common Lobster is black when seen in a living state, but there are other species which are blue, red, and other colours. Much that has been written in Mr. Gardiner's admirable life-history of the River Crayfish applies equally well to this marine animal.

**Edible Crab.**—"Crab" is the popular name for a very large number of what are scientifically called *Dec'-a-pods* (Greek, *deca* = ten; and *pous*, *podos* = a foot) and this includes also Lobsters, Crayfish, etc.

If a common Crustacean, such as a Crayfish, a Shrimp, or a Prawn, be examined, it will be seen that the outer covering is made up of a number of rings jointed together, to which the feelers, the claws, and the legs are united, and that, to give a greater protection to the soft parts of the body, a number of these body-rings are, as it were, soldered together into one piece, as in the Crab and the Lobster, forming a kind of cuirass, such as a knight in armour used to wear.

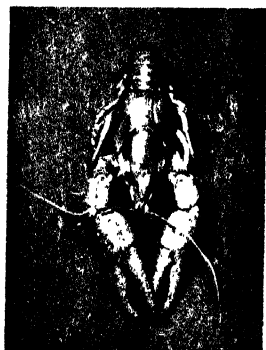
There are an immense number of Crabs, but by far the most important in the British seas is the Great Crab, or Edible Crab. The shelly body (or "carapace" as it is called) is often of great size and thickness. The claws are tipped with black, and are very strong. The four simple walking legs are



ACORN PARNASSIENS ON BOULDER



WHITE, ACORN PARNASSIENS,  
AND BROWN CRAB'S SHELL (AL TOP)



RIVER CRAYFISH



EDIBLE CRAB



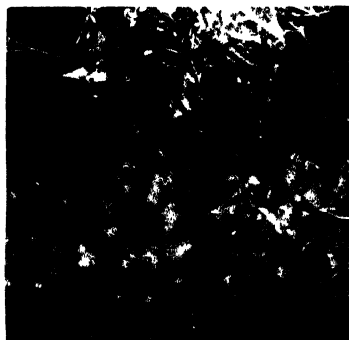
*PLATE LXIV*



GARDEN SPIDER AND EGG



SPIDER AND SNAKE



WEB OF GARDEN SPIDER



MILKWEED

hairy. This Crab has formed an article of diet for ages, and its excellence is mainly due to the enormous development of the liver, which occupies two sides of the carapace inside, and is the yellow part of the crab.

Crabs are caught in what are called "Crab-pots," a kind of wicker basket. These are so made that they form a trap, with an entrance at the top. A piece of fish is fixed inside the pot by means of a skewer; the pots are then sunk by stones to the bottom of the sea, being secured by a long line with a piece of cork floating at the end, and when the Crabs go inside to eat the bait they are unable to get out again. Crabs feed chiefly on other animals, both dead and alive.

Almost all Crabs live in the sea, but mostly in shallow water. They lay eggs, and the Common Crab will lay as many as 20,000, which are generally red or yellow, and very small. These are not left in the sand like the eggs of fishes, but are carried about by the female hung on to little hairs on the "tail" until hatched. When the young Crab is born, it is very different in shape from the adult Crab, for it has a long tail. It changes into another form (still with a long tail), and last of all the tail comes off and the young creature becomes a Crab, about  $\frac{1}{8}$  inch across. These changes are similar to the changes of a Frog, from egg and tadpole to full growth.

Like all Crustaceans, Crabs "moult"—*i.e.*, cast their shells. These moults are very frequent whilst they are young, and the body grows rapidly. Before moulting, the old shell dies, the new shell begins to form within the old one, and at last, with a great deal of trouble, the old shell is cast off. This moulting is so difficult that many Crabs and Lobsters die in the process. In casting its shell, the Crab parts with every joint and plate of its body, the covering of antennæ, jaws, claws, tail, the linings of its gills, stomach, eyes, and all its other parts; and thus, when the creature has escaped, the shell is nearly as perfect as the animal itself. The new shell, which is very soft, requires hours, or even days, to acquire firmness.

As an article of food, the male is more esteemed than the female, being larger and having larger claws. The two sexes may easily be distinguished by the size of the "tail," which is

the name given to the loose part, or "apron," this apron being narrow and more pointed in the male than in the female.

The Edible Crab must not be confounded with the little Shore Crab, which is not usually eaten, but which should be sought for when the young naturalist is at the seaside.

The scientific name is from the Latin *cancer* = a crab, and *pagurus* = also the name of a kind of Crab. "Crab" is an Anglo-Saxon word, allied to the German *Krabbe* = a crab, and the Dutch *crabben* = to scratch, to claw.

**Hermit Crab.**—In this species we have an interesting example of how one animal will take advantage of the covering of another for protective purposes. Unlike the animals we have recently been considering, the Hermit Crab does not possess an entire shelly body. Its hinder portion is soft, and it thus comes about that it is essential the creature should adopt some means whereby it may be protected. He thus becomes known as a Hermit by reason of his taking possession of the shell of some mollusc such as a Whelk. Empty shells are not invariably chosen wherein the Hermit Crab may secure the hind and soft portion of his body, for the creature has been seen carefully stalking along the shore, and actually dislodging the mollusc from its rightful home, devouring its body, and then himself taking possession of the empty shell! The long tail is soft and fleshy, quite defenceless and unprotected. If a Hermit be examined in the shell of a Whelk or other mollusc it will be observed that its legs and claws are tightly wedged together in the front part of the shell, so as to fill the opening completely. One claw, it will be ascertained, is much larger than the other, and rests in front. Take hold of the Hermit and gently dislodge him from his chosen citadel. It will then be found that the front of his body and the legs and claws are hard, and well calculated to protect him. As you proceed to expose his body more, however, you will observe the long, soft, fleshy, and unprotected hinder parts, and thus have ocular demonstration of the reason why the Hermit chooses the shell of a Whelk, or other mollusc, as his home.

**Class II.—ARACHNIDA (SCORPIONS, SPIDERS,  
MITES, Etc.)**

**Scorpions.**—We now come to a group of animals belonging to the Arthropoda, the members of which (excepting Mites) possess two principal divisions of the body, the head and thorax being joined together, and the abdomen forming a separate division. We have thus to deal with the Scorpions, the Spiders, and the Mites. The former, for the most part, inhabit warm countries, and in some parts of the world species of large dimensions are found, measuring 9 inches in length. They are nocturnal in their habits, and Mr. Kirby states that "they kill the insects and other small animals on which they feed with their stings, the sting of one of the large black Scorpions, like that of the large tropical Centipedes, being as painful and dangerous as that of a Snake. There are a few small and comparatively harmless species found on the shores of the Mediterranean."

These animals have the habit of rapidly turning up the hind portion of the body, in a similar manner to the Earwig and the Devil's Coach Horse Beetle, for the purpose of stinging. The two British insects mentioned are, however, of course harmless. There are also False Scorpions and Whip Scorpions. The former are small creatures, resembling Scorpions in form, but having no sting. They are fond of inhabiting houses where dusty old books are kept, and I have noticed also that a very minute black species infests books that are well looked after. It is quite a minute creature, black in colour, but has the characteristic habit of at once turning up its tiny abdomen when touched. Whether they do any harm to books, or in the house, I do not know. I have never noticed their depredations, and I understand that the food of these False Scorpions consists of Mites and other small creatures. They have the habit, says Mr. Kirby, of attaching themselves to the legs of Flies, for the purpose of being conveyed from one place to another.

The Whip Scorpions do not inhabit this country, and may be passed by without comment.

**Harvest Men.**—Before coming to the Spiders—so often wrongly referred to as insects—we may briefly mention the

**Harvest Men.** These creatures have very long, thin legs, a *small body*, large pincers, and two eyes. They feed on Plant Lice and other small insects, and are often called Harvest Spiders. These are not, however, true Spiders, and the latter name should not be employed when speaking of these animals.

### Spiders

There are a large number of these vastly interesting creatures, but we can only mention a few of the commoner kinds likely to come under the notice of the young naturalist. As a matter of fact, the histories of these animals are so wonderful, and there is such a wealth of detail connected with them, that many naturalists devote their whole attention to them. We can do but scant justice to them in these pages, but would strongly commend their study to the zealous young worker in the domain of scientific research and observation. Before setting out the salient features of the few typical species we are able to consider, let it be clearly understood how a Spider differs from an insect. For this purpose the following table, compiled by Mr. Oswald H. Latter, affords much information in a condensed form :

| <i>Insect</i>                             | <i>Spider</i>                             |
|---|---|
| Antennæ present.                          | Antennæ absent.                           |
| Eyes compound, two.                       | Eyes simple, eight.                       |
| Head divided from thorax by neck.         | Head and thorax indistinguishably united. |
| Legs, six.                                | Legs, eight.                              |
| Abdomen segmented.                        | Abdomen not segmented.                    |
| Silk produced from near mouth, if at all. | Silk produced from near the tail.         |

Spiders possess strong, poisonous jaws, and some of the larger kinds found in foreign countries are formidable enemies of man himself. Some feed upon birds—such as the large Bird-Catching Spider of South America, which has a body 3 inches long, and strong, hairy legs—and many exhibit various wonderful contrivances by which they capture their prey. In this connection we may mention the Trap-Door

Spiders, one species of which is upon the British list. This species, however, does not construct a trap-door or silken gallery in the ground, but forms a silken tube, which serves the purpose of enabling the owner to clutch the insect that settles upon it in a most ingenious manner. The remarkable webs which Spiders construct are known to everyone—not so much the “cobwebs” made by the House Spider as the wonderful web of the Garden Spider, which exhibits a beautiful example of the patience, perseverance, and ingenuity of these creatures. In many, many ways Spiders are most interesting and fascinating, but it is only as a result of keeping personal watch upon them that any adequate idea can be obtained of the fund of interest and wonder connected with them.

**House Spider.**—This species is brown in colour, and possesses long and strong legs. These latter, however, are not nearly so long nor so slender as those of the Harvest Man, which, as will be remembered, cannot be considered as a true Spider. The House Spider has a remarkable power of movement. It is very quick and active, and threads its way along by means of its long, strong legs in a most energetic and capable manner. Although much disliked by the ladies of the household, both by reason of its presence and its habit of spinning webs in rooms, this is really a most interesting species, and if rooms are left sufficiently long uncleaned to permit the Spider to construct its web, then surely it is the fault of the housekeeper for not being industrious. Indeed, the Spider shows considerably more industry, and we may gain many useful object-lessons from these animal folk if we only learn to judge them aright. It seems strange that there is such a feeling of repulsion against the useful Spiders. They are perfectly harmless—at least our British species are—and are too often regarded, not only as repulsive creatures, but with a great amount of dread.

Spiders are divided up into a number of groups, such as Bird-Catching Spiders, Trap-Door Spiders, House Spiders, Orb-Spinners or Garden Spiders, Gossamer Spiders, Water Spiders, Running Spiders, Spring Spiders, and others. Of most of these we have British representatives, and perhaps,

next to the House Spider, the beautiful Diadem Spider of our Gardens is one of the best known.

**Diadem and other Spiders.**—Whilst various kinds frequent our gardens, some small, others large, the Diadem is one of the largest and the most beautiful of our British species. It is nearly an inch in length, and reddish or green in colour, with a white cross on the back bordered with black. Examined through a microscope, it is a sight to behold this wonderful creature, and it is only by this means that any detailed idea can be obtained of its marvellous form, colouring, and structure. Each tiny portion of the Spider's anatomy is a perfect revelation to the seeing eye, and even if we only make a point of noticing the foot, we shall be intensely interested and entertained. Let me tell you about this wonderful appendage, and then afterwards you can examine same for yourself, and test whether I am given to exaggeration.

If the foot be closely examined it will be found to bear three strong horny claws. On the largest of the three there will be found to be eighteen teeth, on the next largest fifteen teeth, and on the smallest of the three claws there are usually three or four teeth only. What purpose, then, do these claws and teeth serve? you will ask. Briefly, the operations performed by these remarkable appendages are—the cleaning of the Spider's body, the regulation of the rate of issue of the filaments of silk as they proceed from the spinnerets, and they greatly aid the creature when it is proceeding, Blondin-like, over its almost invisible "tight-rope," or hanging suspended as from an unseen wire. Then, again, there can be no doubt that in the construction of the web the foot plays a very important part, and in various other ways the remarkable foot to which I have drawn attention is of great and useful service. I am most anxious that the young naturalist should see a Spider's foot for himself, or examine a micro-photograph of same. A very fine photograph of one such appears on p. 149 of my book, "The Story of Insect Life" (Culley).

The beautiful webs constructed by the Garden Spider will have been observed by the reader, and doubtless surprise has been expressed as to how it is possible for such a small creature

to build up, absolutely unaided, such a wonderful structure. Notice the next time you look at one how the principal threads radiate in all directions from the centre, and the general symmetrical appearance of the whole mazy web. Touch the web gently when the spider is found at home. When first seen he may be quietly waiting for his prey, but set him going, as it were, and notice how active he is, and how grossly perturbed, agitated, and excited he becomes as a result of your unwarrantable intrusion into his precincts. Are not these creatures, too, wonderful aeronauts? The little "Money Spiders" that deftly suspend their bodies in the air, or float through the air like so many tiny aeronauts, must have been noticed by everyone. What remarkable powers of movement these minute organisms possess, some of them so small that they can only be seen in any detail by the aid of a magnifying-glass or a microscope.

The nesting habits of Spiders are vastly interesting, for whereas the eggs of the majority of species are laid in a silken case, which is attached to crevices of buildings and elsewhere, the Running Spiders, that travel so quickly over the ground, actually carry their egg-sac about with them, the same being attached to the end of the body. It is a curious experience to notice this for the first time, and on many occasions I have had my attention drawn to the strange phenomenon, and been asked whether it was food that the creature was dragging along with it! Not long since I was naturalising on a fine tract of heather-clad moorland, and there made acquaintance with the cocoons of the Fairy Lamp-Making Spider (*Agræca brunnea*), which, when seen at their best, are, for fairy delicacy and beauty, remarkable examples of animal architecture.

The males of many kinds of Spiders are smaller than the females, and it is a vastly entertaining sight to watch the courtship habits of these creatures. If the male shows the slightest provocation or ill-tempered feeling, the female makes no attempt at reconciliation, but promptly eats the male, and so puts a stop to his tantrums! Strange but wonderful animal folk these! It is the Gossamer Spider that floats so buoyantly in the air, and especially is this noticeable in the Autumn. It is this species, too, which covers grass and other herbage with its web



strands, these being far more noticeable when there has been a heavy dew overnight. The Water Spiders construct an ingenious home under water that is composed of water-tight silk. It has been compared by Mr. Kirby to a diving-bell, and this they inflate by carrying down bubbles of air from the surface.

Cannibals as they are, and most voracious, Spiders are, nevertheless, useful animals in ridding us of an enormous quantity of insects, and as regards the general character of their lives and habits they are hardly superseded by any other form of animal life.

**Mites and Ticks.**—Before coming to the Centipedes and the Millipedes, the last animals to be considered in our present section, a few notes may be given concerning the Mites and Ticks. Most of these are very microscopic in size, and should be specially studied if any measure of success is to be obtained. The body is one round or oval mass. There are scattered hairs borne upon it, and whilst some have eight legs, most Mites only possess six when in their younger days, and the Plant Lice only have four. Many are parasitic upon warm-blooded animals; others infest insects and other creatures. Some feed on decaying or vegetable matter, and in this connection may be mentioned the Cheese Mite and the Sugar Mite, whilst the so-called Red Spider, which is so destructive to plants, is in reality a small scarlet Mite. The four-legged Gall Mites prey upon plants, and their operations result in the production of galls or other excrescences on the plants to which they give attention.

Whilst we in this country do not suffer to any appreciable extent from the ravages of these Mites and Ticks as compared with countries enjoying a warmer climate, they are sufficiently numerous and destructive to call attention to them when anything like a bad infestation is experienced, and there is a wide field for original research and study open for the young naturalist among these minute organisms.

**Class III.—MYRIAPODA (CENTIPEDES)**

**Centipedes and Millipedes.**—These animals have long, worm-like bodies, which are made up of a number of rings or segments, each ring or segment bearing a pair or two pairs of legs. They possess, like insects, one pair of antennæ, or feelers, of which they make good use. They do not, however, like insects, pass through any metamorphoses. When first born they are either legless or only possess a few pairs of legs. Thereafter, as they grow, the number of these appendages is increased. When the adult state is reached a great number of legs are possessed, and whilst the Centipede is commonly known as Hundred-Legs, and the Millipede as Thousand-Legs, usually the number is something under one hundred.

Centipedes have long and flat bodies, and are very swift and active creatures; Millipedes are round, and have the habit of rolling into a spiral when touched. A common Centipede in England will be found underneath stones, pieces of bark, and other places. It is reddish in colour.

Mr. James Aird, of Girvan, Ayrshire, is kind enough to send me an account of an interesting episode respecting an Earthworm and a Centipede. My friend was seated one day on a garden chair, and observed an Earthworm, about 3 inches long, come out from a small heap of leaves and rubbish. The worm was in great haste and apparent excitement. It scurried along the edge of a flower border where there was an edging of wood an inch or two high, and directly after a Centipede came out from the same rubbish heap. This creature was also in a great hurry, and, Weasel-like, made tracks for the Earthworm. After the latter had travelled some short distance, it came to a part of the wooden border which was only a little above the level of the earth, when it "halted." Here it quickly crawled over, and commenced doubling on the back track until it reached a soft part of the earth. Then it proceeded to burrow, and had got fully half of its body embedded when along came the Centipede! Immediately the last-named spied the portion of the worm still on Mother Earth; it fastened upon it, held on tightly, and evidently obtained considerable sustenance from

the poor Earthworm, as shortly after the latter was merely a limp and shrivelled skin.

No British Centipede or Millipede is venomous, but there are tropical kinds whose bite is very painful and dangerous.

The Centipedes feed mostly upon Earthworms, as the above incident clearly shows ; but the Millipedes are vegetarians, and are said to be very destructive. The Common Snake-Millipede is about  $1\frac{1}{2}$  inches in length, brown in colour, with yellow rings, and ninety-nine pairs of short white legs.

Centipedes, it should be noted, only have one pair of legs attached to each segment of the body, whereas Millipedes have two pairs of legs on each segment, excepting on the first three situate behind the head.

## CHAPTER VII

### GROUP I (*Continued*).—ARTHROPODA, OR JOINTED ANIMALS

#### Class IV.—INSECTS

**W**E have now reached a very important part of our work—namely, the Class Insecta of the Arthropoda, or Jointed-limbed Animals, one of the largest divisions of animal life.

Perhaps, next to birds, boys are more fond of insects—and the Lepidoptera in particular—than any other creatures upon the British list. There is no doubt that the breeding of Butterflies and Moths at home, under one's own eyes as it were, is a very fascinating and exceedingly interesting occupation as first the eggs are secured, then the hatching is watched until the larvæ appear. These latter require feeding; they possess enormous appetites as a rule, and need a good deal of attention. Having eaten sufficient, the larva feels the time has arrived for it to change into a pupa, or chrysalis, and the gradual evolution from the egg to the perfect insect is being performed almost before one's eyes. Having pupated, the



BRITISH INSECTS

(for Details see over)

1. Orange-Tip Butterfly (Male) (*Enallagma cyathigerum*)
2. Red Admiral Butterfly (*Vanessa atalanta*)
3. Common Tiger Moth (*Parusica*)
4. Large White Butterfly (female) (*Parus brassicae*)
5. Eyed Hawk Moth (*Samolus ocellatus*)
6. Green Tiger Beetle (*Chandela canhestres*)
7. Hornet (*Vespa crabro*)

young entomologist has to exercise patience until sufficient time has elapsed for the pupating process to become accomplished in its entirety, and then eventually the exciting time arrives when the perfect insect emerges from its hiding-place, and is given an honoured place in the young entomologist's collection.

Now, I am of opinion that, provided the collector is not indiscriminate, a more interesting, useful, and distinctly wholesome hobby is not to be found in the whole realm of Nature than that of collecting and breeding Lepidoptera, or Butterflies and Moths. For this reason: the young observer has of necessity to act very much on his own initiative, to make a whole series of notes, to keep accurate data, and to learn a good deal before he can accomplish even a very little. He must be acquainted with the food-plants of the larvæ; the plants, etc., whereon and wherein the female insect deposits her eggs; he must know when and where to search for various insects, their eggs, larvæ and pupæ, and in many, many ways I am of opinion that the entomologist has to be considerably more energetic, resourceful, and painstaking than almost any other worker in the whole domain of Nature-Study.

I am anticipating our subject too much, perhaps. Let us bring these preliminary remarks to a conclusion, and learn at once what an insect is. We shall consider in some detail the structure and life-histories of the Honey Bee, the Ant, the Humble Bee, the Wasp, and the Silkworm Moth, as we come to them, for each of these are far too interesting and important to be passed over with a few words of comment. These life-histories, then, will in their way illustrate for us much that has to be told of the fascinating story of insect life generally, but before coming to them it is necessary that the salient characteristics of insects should be clearly understood. The following information is taken from Mr. Alfonso Gardiner's "Notes on Bee Life," to which reference will again be made when we come to consider the life-history of that remarkable member of the Hymenoptera.

"All insects have jointed bodies and limbs, but no backbone. Their outer covering is a kind of horny skin called

*Chi'-tin* (from Greek *chi'-tōn* = a tunic or outer dress. *Chi'-tin* (*ch = k*) is a horny skin). The parts of the body of an insect are, the *Cap'-ut* or *Head*, the *Tho'-rax* or *Chest*, and the *Ab-do'-men* or *Belly*, and these are distinct from one another; hence the name 'insect,' which is Latin, and means 'cut into' parts. These three parts each consist of a number of rings; one ring generally forms the head, three the thorax, and from nine to sixteen form the abdomen.

"A perfect insect has usually three pairs of legs, and these are all jointed on to the thorax, one pair to each ring. The feet of some insects have claws, and some have a kind of pad by which they can walk with the back downwards, as the House Fly. The feet of others are adapted for digging (especially several kinds of Beetles, as the Scavenger Beetle), and others for swimming, as the Water Beetle.

"Usually an insect has two pairs of wings, but one pair may be wanting; these are also attached to the thorax above the legs. All insects breathe by means of air tubes called *Trache'-æ* (Latin *tra-che'-a*, plu. *tra-che'-æ* = the windpipe, from Greek *trachys* = rough; the trachea is in Greek properly *tracheia artēria* = the 'rough artery,' because of the rings of gristle which strengthen it), which open along the sides of the abdomen by little mouths called *Stig'-ma-ta* (Latin *stig'-ma-ta*, plural of *stig'-ma* = a mark, as a pin-prick; these little mouths are very small indeed) or *Spi'-ra-cles* (Latin *spi-rac'-u-lum* = an air-hole, from *spī-rā'-re* = to breathe). These tubes spread from the sides of the abdomen all over the interior of the body. Insects have no lungs.

"All insects have two very delicate organs of touch growing out of the head, called *An-ten'-næ* (Latin *an-ten'-na*, plural *an-ten'-næ* = a horn or feeler) or *Feelers*, which are very full of joints and nerves; these are not legs. It is thought by some learned men that the antennæ contain the organs of hearing, smell, and touch. The antennæ of different insects have many and varied forms.

"As insects feed on various kinds of food, some living on animal and others on vegetable substances, while others suck juices, there are great differences in the shape of their mouths.

In some, the mouth is formed for gnawing (as Beetles and Cockroaches), or for cutting and tearing (as the *Paper-Making* Wasps), and some only for sucking (as Butterflies, Moths, and Bees).

"Insects which live by sucking take in their food through a kind of tube, called a *Pro-bos'-cis* (a Latin word, from Greek *pro-bos'-his* = a front feeder; a trunk) or *Trunk*, which runs out from the lower lip. It varies much in length and shape in different insects. The proboscis is not really a tongue.

"Most insects have two large eyes. These are usually compound—*i.e.*, they consist of a great number of small ones grouped together on the side of the head; there are also often three or more simple eyes between them. The compound eyes of the Common Fly are each composed of about 4,000 simple ones.

"Most insects, such as Butterflies, Moths, Beetles, Flies, Bees, Wasps, Hornets, and Ants, are produced from eggs. Many insects take no care of their eggs, but leave them to be hatched by the warmth of the air, etc.; but Bees, Ants, and many others rear their young with great care. The eggs of most insects pass through several changes before they become complete insects; these changes are called a *Met-a-mor'-pho-sis* (a Greek word meaning 'change of form'). This metamorphosis properly consists of four stages—the Egg, the Larva or Grub, next the Pupa or Chrysalis, and finally the Imago or perfect insect. All the insects mentioned above, and many others, undergo these changes from the egg to the winged insect; but others, such as Grasshoppers, Crickets, Dragon Flies, etc., never have the worm-like form, and do not shut themselves up in cocoons.

"Insects inhabit the earth, the air, and the water in all parts of the world, and are very important creatures; it is probable that they exceed in number all other living creatures taken together. The largest varieties live in very hot countries.

"Insects provide food for one another and for a number of small animals and birds. Several of them are useful in our



daily life, such as the Cochineal (a kind of Bug), which is used for making red ink, and the beautiful colours Carmine and Crimson Lake (the dried bodies of the female being used for these purposes); the Honey Bee, which produces honey and wax; and the Silkworm, from the cocoon of which silk is obtained. But, above all, many insects assist in fertilising flowers, and so cause a crop of seeds and fruits."

It will be readily understood that the vast number of insects have made it necessary that some scheme for classification purposes should be evolved, and so it comes about that these animals have been classified into a number of different Orders, commencing in the case of our own British species with the Coleoptera, or Beetles, and ending with the half-winged and two-winged insects, such as the Gnats, Daddy-Long-Legs, Flies, and Fleas.

The Lepidoptera, or scale-winged insects, embrace the Butterflies and Moths, and whilst we have not a great number of different species of Butterflies, there are a very large number of Moths, many of which are of such small dimensions that they are rarely seen, and difficult to identify even when they are. Moths, too, are mostly nocturnal in their habits. Although the members of each Order, and then again each family, are in their way intensely interesting, and their life-histories absorbing, perhaps the Hymenoptera, which includes Ants, Bees, and Wasps, are the most attractive. We ought not, however, to differentiate thus, nor show any special liking for any particular section where all are so wonderful and a study of them so engrossing.

We may now proceed to deal with a few typical examples of the commoner kinds of British insects under each Order, for it is positively impossible in a work of such a comprehensive character as the present to deal at all adequately with the uncommon, rare, and rarer forms of wild life, and we wish to keep to the rule which was made at the commencement of our task—namely, to give the important points in connection with each animal dealt with rather than compose a mere list of names unlikely to be of service to the young naturalist.

Our task, therefore, is to deal with the undermentioned Orders :

Order I.—Coleoptera (Sheath-Winged Insects, or Beetles).

Order II.—Straight-Winged Insects (Earwigs, Cockroaches, etc.).

Order III.—Nerve - Winged or Lace - Winged Insects (Dragon Flies and their relatives).

Order IV.—Hymenoptera (Ants, Bees, Wasps, etc.).

Order V.—Lepidoptera (Scale-Winged Insects, or Butterflies and Moths).

Orders VI. and VII.—Half-Winged and Two-Winged Insects (Bugs, Froghoppers, Gnats, Crane and other Flies, etc.).

#### **Order I.—COLEOPTERA (SHEATH-WINGED INSECTS, OR BEETLES)**

The species of insects which go to make up this first and very important Order, the Coleoptera, or Beetles, are stronger numerically than any other order included in the insect class. There are about 300,000 different kinds of insects known to science, and of these nearly one-half are Beetles. In Great Britain alone we have over 3,000 different kinds, and it will thus be seen that, however inadequately our list of about twenty or thirty species represents this large number, it is impossible for us to deal with them, even if they be merely set out in catalogue form. Then, again, several of these are rare; many are uncommon; a large number are nocturnal, or live underground and are rarely seen; and others, again, are very small, and are not likely to come under observation unless specially hunted for.

The distinguishing characteristic of the Beetle's body is the horny or leathery texture of the fore-wings. These latter cover the folding membranous hind-wings, which are alone used for the purposes of flight. So neatly and ingeniously are these flight-wings tucked away and hidden that many people express surprise when informed that these insects do possess the powers of flight. It is only those kinds that happen to come under direct notice, such as the favourite little Ladybird,

the Cockchafer, Rosechafer, the Dor Beetle, and a few others, which go to show the ordinary individual that Beetles have undeniable flight powers. Few, for example, are acquainted with the fact that the Devil's Coach-Horse, the Earwig, and the Wood Ant can fly, the two latter, of course, not belonging to the Coleoptera.

In many ways Beetles are exceedingly interesting: some possess, for instance, both simple and compound eyes; the antennæ, or feelers, present great variation; the mouth is adapted, according to the life of the individual, for piercing, sucking, seizing, and dividing food. The legs and wings also vary a great deal, and a similar remark may be applied to the eggs, larva, pupa, and imago; in fact, the whole structure and life-histories of these Beetle folk are such that to gain any intimate insight concerning them the young inquirer should specialise upon the subject, and become what is known as a Coleopterist.

**Green Tiger Beetle.**—This is a common British species, possessing—as its name implies—bright green wing-cases. The outer surface of the fore-wings bears white spots. The legs and antennæ are much darker in colour, and the abdomen is metallic blue. The Green Tiger is a fast runner, and the long, slender legs are of great use to it for this purpose. It lives upon insects, and these it catches in an ingenious manner. So also does the larva of this Beetle; for it will burrow in a sandy place, there to lay in watch for its prey. Sandy and grassy districts are the resorts of this species, and there it should be sought for. Although it runs so adroitly, it flies in a jerky, hesitating manner.

**Purple or Violet Ground Beetle.**—This species has black wing-cases, and these bear violet margins. It may be found in gardens, and emits, when handled, a fluid of a distasteful odour. In the Winter this Beetle hides under stones, in crevices of walls, underground, and other places, but when Spring-time arrives it becomes more active. These creatures do not, however, fly, as their wings are only rudimentary, and their wing-cases are locked together, and are rarely opened. As burrowers under the soil, or runners over it, these insects are

seen at their best. They are useful, too, feeding upon small obnoxious insect pests that infest our gardens and fields. They are thus good friends of both the gardener and the farmer, and should not be destroyed.

**Bombardier Beetle.**—This Beetle is red and blue in colour, and is a common species. Like some of its relatives, it has the habit, when handled, of discharging an acrid fluid. This is given off from the tip of the abdomen, and when the discharge is accomplished, it is accompanied by a little puff of whitish vapour. There is also a distinct report accompanying this curious performance, and hence the Beetle has been accorded its English name of Bombardier or Artillery Beetle. It hides under stones, and should be sought for near the banks of rivers and on the coast, especially in chalky districts.

**Great Water Beetle** (*Dytiscus marginalis*).—This is a large olive-brown Beetle, bordered with yellow, measuring about  $1\frac{1}{2}$  inches in length and over  $\frac{1}{2}$  inch across. It should be looked for in a weedy pond, for here it delights to make its home. The hind limbs are long, flat-like, and fringed with hairs, and by means of these this fine Beetle swims. As a matter of fact, these are used as a pair of powerful oars. It dives under the water for food if it cannot find anything to its liking upon the surface, and carries down with it a supply of air beneath its wing-covers. When the supply is exhausted it appears at the surface again to breathe, and then sinks again with a fresh supply.

It is also capable of flight, and if food is scarce, will readily leave one pond and fly away to another, there to resume its feeding operations. It resorts to stagnant water, and the flight of this Beetle from one pond to another helps us to understand how the seeds of aquatic plants and even animals are distributed, the insect carrying some of these upon its body as it pursues its wanderings.

It has been termed the Crocodile of insect life, for both in the larval and perfect states it is a most voracious feeder. The larva is a firm, fleshy, and ugly-looking creature built up of segments. It possesses large jaws, and these are long, incurved, and perforated at the tip. When seen in the water,

it will be observed that it hangs tail upwards. For what purpose? you will ask. Because its breathing apparatus is contained in its tail. In this condition, then, it awaits its prey. At last some unwary water creature comes within striking distance; the larva opens his monstrous jaws, tears the body of his victim to pieces, extracts the juices, and is ready for the next meal! When in the adult state it is perhaps not such a savage and ferocious monster, but even then its presence strikes terror into the hearts of the smaller inhabitants of the pond, and they scuttle away helter-skelter at its approach. Although a most interesting tenant of the aquarium at home, care should be exercised in keeping this carnivorous creature with other forms of aquatic life, or they will be devoured.

There is another large Water Beetle which should not be confused with the last-mentioned species, as it is a vegetarian in its diet. It is shining black in colour, and does not possess the modified hind limbs for swimming purposes.

**Devil's Coach-Horse.**—The young reader will be sure to have seen this curious defiant Beetle in the garden. It may frequently be seen on the garden path, or may be turned up among the soil. One thing I admire about this insect is that it always looks beautifully clean, even if it has just been ejected from its earthy home; indeed, ground Beetles generally, and insects as a whole, appear to be extremely particular about their toilets.

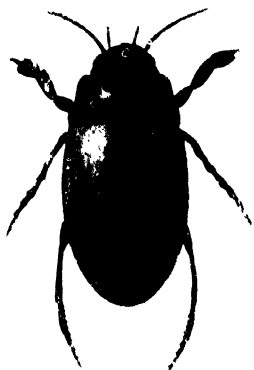
That the present insect has attracted attention by its curious habit of turning up the end of its abdomen, and in other ways, is evidenced by the receipt of the following questions that have recently been addressed to me by an unknown correspondent. Let me give my correspondent's queries first, and then I will do my best to supply the answers. By this means we shall be able, perhaps, to lay some information before the reader of which he was previously unaware.

**Questions.**—1. With reference to the insect known as the "Devil's Coach-Horse," what is the Latin name and class?

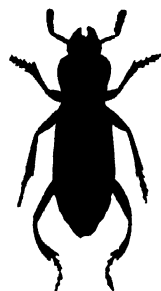
2. What are the two white projections which issue from its hind parts when its body is elevated, and the insect, being irritated, is prepared for an attack?



DEVIL'S COACH-HORSE  
BEETLE



GREAT BROWN WATER BEETLE



LURVING BEETLE



A PAIR OF STAG BEETLE

PLATE LXVI



COMMON COCKCHAFER



A PATH OF GURG WORMS



THE GEESE

3. Is this insect capable, as some people suppose, of inflicting a sting? or is it perfectly harmless?

4. Is it not a fact that these insects exhibit a certain amount of intelligence like the Ant?

5. What other insects besides the Devil's Coach-Horse are capable of raising, or do raise, their bodies when angry, and bending them forward? Does not the Earwig act in a similar way?

6. Does this insect fight in the attitude it assumes, or what signifies this spasmodic movement of the body which appears so truculent?

*Answers.*—1. The Latin name of this insect is *Ocypus olens*, and it belongs to the Coleoptera, or Beetles.

2. These are two yellow glands which pour out, when required, a vile-smelling secretion, which makes a bird or other animal conclude the Beetle would not be good eating. It is owing to this that it has acquired its specific name of *olens*, which means stinking.

3. It is perfectly harmless, excepting perhaps that its strong mandibles might inflict a nasty "nip."

4. Not that I am aware of, excepting that I have observed the creature feign death in a most realistic manner.

5. Yes, certainly the Earwig does, so also do the Scorpions.

6. The Devil's Coach-Horse fights with its strong mandibles, and it turns its tail over to assist in neatly folding up the very long wings which are situated beneath the very short wing-covers. It is a most useful insect, a veritable scavenger, feeding upon refuse, carrion, and decaying matter of various kinds. The larvæ are carnivorous, and may be found during Spring under stones or when digging in the garden.

The adult insect is about 1 inch long, and jet-black in colour.

I hope I have now succeeded in answering my correspondent's questions satisfactorily and accurately, and also afforded some useful information to the reader of this book.

**Burying Beetles.**—These interesting Beetles have also been accorded the name of Sextons, and are well named from their habit of burying dead animals. There can be little doubt that—selfish although the object may be—these insects play



the part of scavengers to the letter, and rid the land of a number of dead creatures which, if permitted to lie above ground, would in many instances be the reverse of pleasant. Can it be that these Burying Beetles are responsible for the clearing away of the bodies of most of our dead animals? for, when one comes to consider the question, is it not remarkable how very few animals we find who have died a natural death? Many, no doubt, hie away when illness, old age, or disease overtakes them, and die in some secluded retreat; but when rambling in the country, it is astonishing to notice how comparatively few dead animals one finds. Is the secret revealed by the action of these Burying Beetles?

There are several species, but the commonest kind is brownish-black in colour, spotted and banded with orange-yellow. The head is large and powerful, and this aids the insects in scooping out a hole in which to inter the body of the animal that has been found by these useful creatures.

If a Burying Beetle be watched, it will be observed that the earth is scooped out from underneath the animal's body. The latter, when sufficient earth has been excavated, drops into the "grave," and the insects give the animal a decent burial by covering over its body with the earth that has been scooped out. Before, however, this is finally accomplished the female Beetle lays her eggs in the body of the dead creature, upon whom several individuals have concentrated their attention. When these eggs hatch the larvæ find an abundant food-supply near at hand, for they feed upon any flesh that may be left, and clear away everything, until eventually only the bones remain. After it has eaten sufficient the larva goes through a metamorphosis underground.

**Flat Burying Beetles.**—These Beetles differ from the last-named in having a flatter body, and are silky-black in colour. Whilst willing to aid the Sexton Beetle in giving a decent interment to an animal, they do not bury the body on their own account. They feed upon it, and then, having eaten sufficient, call the Sextons to their aid for the purpose of performing the burial rites. We have an apt illustration in the case of these two kinds of Beetles of the wonderful manner

in which everything in the world of animal life is used up, and how rare it is that we notice any apparent waste in Nature.

**Museum Beetle.**—This destructive Beetle is a near relative of the species last under review. It perpetrates considerable harm in museums and among collections of birds and other animals, by eating their stuffed bodies. I have known collectors of insects, who have not taken the care of their specimens that they ought to have done, to suffer a good deal from the ravages of this insect, the whole body of a Butterfly or Moth being entirely eaten away.

**Stag Beetle.**—This very handsome and large Beetle is a great favourite among boys. The size and formidable character of the male Stag Beetle make him appear a bold, fine insect, and some specimens have come under my notice which were magnificent types of this interesting British insect.

It is very entertaining to watch a male and female Stag Beetle courting. You may easily identify the chocolate-black male, because it is he who bears the fine pair of horns, or antlers. Whilst the female does not possess these prominent appendages, she has more powerful jaws.

I have watched the courtship habits of this Beetle with interest. The male does his utmost to attract the attention of the female, displaying his body to the very best advantage. He follows the female about, undertakes flanking movements, frontal attacks, and other manœuvres in his endeavours to arrest attention and claim her as his consort. I find, however, that the female Stag Beetle is very obstinate on occasions, and the male has to resort to many devices before he can get her to respond to his love-making. So much so, indeed, that a pair I had under observation on one occasion caused me an immense amount of entertainment, until the male, absolutely disgusted with the treatment meted out to him by the female, took her up in his mandibles and carried her bodily to a conveniently secluded spot in a hedgerow to undergo the marriage ceremony! This insect claims kinship with the Leaf-Horned Beetles. The terminal joints of the antennæ lie one upon the other. This has resulted in the above name being accorded. The Cockchafer belongs to the same group, as those who have examined the

remarkable antennæ of this latter insect under a microscope will doubtless have ascertained on their own account.

Few people, on observing a Stag Beetle crawling laboriously along the ground, appear to realise that it can fly. It is a bold, strong flyer, and often attains a considerable altitude. The grub, or larva, should be sought for in tree-trunks. Here it obtains sustenance by feeding upon the solid wood. A hole is made in the tree by the female with her small antlers, and, having made an incision, she deposits the eggs. The larva spends some time in the tree, until, when ready to pupate, it leaves the tree and commences to bury itself in the earth. A cocoon is constructed, and inside this the pupal state is undergone.

The creature emerges as a perfect Beetle some time in late Autumn, but it is not until the following Summer that it entirely forsakes the cocoon.

If an adult Stag Beetle be examined—and every part of its body will amply repay close examination—it will be seen to possess a curious brush-like organ, which will be found in the centre of the jaw. With this the insect licks up the juices of plants, this constituting the food of the adult.

A curious combat was witnessed not long since in the vicinity of Guildford. Two ladies were walking down the Boxgrove Road in the evening when they suddenly noticed a young, but thoroughly feathered, Greenfinch fluttering about in some grass close to a hawthorn hedge. On stooping down to see what ailed it they found, to their intense astonishment, that it was making frantic efforts to free itself from a male Stag Beetle, who had his mandibles firmly imbedded on either side of the bird's throat. In fact, so tightly had the insect gripped his prey that to pull the two apart threatened to dislocate the victim's neck, and one of the ladies was forced to abandon the attempt, and to content herself with pinching the Stag Beetle violently in the body. When the pressure became intolerable he promptly relinquished his murderous attack on the bird, and clung to the lady's fingers. However, she shook him off without any difficulty, and the Greenfinch, recovering his breath and pluck simultaneously, hastily pecked her hand and

flew away. He was absolutely unhurt, save for the two small holes caused by the insertion of the Beetle's mandibles, and these, luckily, were not deep enough to cause any permanent mischief.

I have known a Stag Beetle to be attacked in mid-air by a large Bat, and for the former to come successfully out of the conflict, but I cannot imagine why a Stag Beetle should attack a bird in the manner indicated above. Have my readers any light to throw upon this strange incident?

**Cockchafer.**—This insect appears in May and June. It is brown and hairy on the thorax, and the tail is curved inwards; there are triangular white spots upon the abdomen, and the antennæ project prominently from the head in a very curious fan-like way.

Early in June the female Cockchafer deposits her eggs in the ground. These hatch towards the end of the Summer, and the larvæ begin to feed at once. They do considerable harm to the roots of farm-crops, more especially as for three years the larval condition is assumed. The full-grown larva measures about 2 inches in length, and is grey in colour. The head and legs are covered with a brownish shell.

The adult insect feeds upon the leaves of trees, and in some seasons the devastation is very great. Several kinds of birds feed largely upon the Cockchafer, and these perform useful service. This is often accomplished at night, and, being unseen, is too frequently unrecorded.

The species of Cockchafer known as the June Bug is smaller than the last-named. It occurs in June or July. It is nocturnal, and in the evening-time may be observed flying in numbers over low trees. It is more hairy than the larger species.

**Rose-Chafer.**—The rose-grower has many enemies and several friends. Between these he should learn to discriminate, but too often, alas! he will not take the trouble to do so. Then, again, there are visitors to his choice floral treasures that do not, apparently, do any damage nor any appreciable good. Among these I think we may safely reckon the Rose-Chafer. It is a beautiful Beetle, possessing bright golden-green wing-cases, marked with wavy white lines.

It feeds upon the nectar of flowers, also the stamens of the Wild Rose, and hovers in the air (it is a day-flyer) like a Moth or Butterfly.

In a similar manner to many of these Beetle-folk, the present species takes some time to complete its life-cycle from the egg to the adult insect. As a larva it lives for some three years, the food eaten consisting of decayed wood. It is fond of resorting to the nest of the large Wood Ant, for it there finds, already gathered, pieces of wood and sticks upon which it can feed.

**Dor Beetle.**—When the young naturalist is taking his rambles along the countryside at dusk, he is almost sure to make the acquaintance of this Beetle of a Summer's evening. Its deep, drowsy hum and blundering flight cannot fail to attract attention, especially if the insect (as so often happens) comes into contact with the wayfarer's face. In colour it is bright black, with violet margins; steel-blue on the under sides and legs, glossed with purple or green.

It is also called the Dung Beetle, for the eggs are laid in manure heaps. In this situation the larva passes the Winter. Like the Burying Beetle, this is a scavenger, one of Nature's sanitary agents, and appears to do far more good than harm.

**Skipjacks.**—There are several kinds of these insects. They have been accorded this curious name because of the habit they possess of springing up and regaining their feet when they have been turned on to their backs, or when they happen to roll over unexpectedly. A brief account of this feat is given in my "Story of Insect Life," which may here be repeated: "This feat is performed with much swiftness and celerity by means of a spine situated on the thorax, which fits into a notch in the abdomen. When the insect lifts its body the highly elastic spine is released; when the body is straightened out this wonderful spine returns to the notch, and this sudden check is sufficient, when the ground is reached, to throw the insect into the air to the height of 2 or 3 inches. This accomplished, it turns over in the air as it is falling, and alights on its feet."

The larva of one of these Skipjacks, or Click Beetles, as

they are also called, is known as the Wireworm. It is very injurious in grass-lands, and also to the roots of growing crops. In some seasons it perpetrates immense damage, and if certain birds—and especially Rooks, Jackdaws, and Starlings—did not prey upon it, greater havoc still would undoubtedly be carried out.

The body of the adult is smooth and glossy, and bears very short legs. This results in the curious method adopted for regaining its feet in the manner already described.

**Glow-Worm.**—Although perhaps the wingless female of this Beetle is somewhat worm-like, why the Glow-Worm ever came to be known by this stupid English name seems shrouded in mystery. As will be observed, it is a Beetle, and not a worm at all, a very different type of animal indeed.

Both the male and the female emit the soft pale green light, but the latter is the chief lamp-lighter of the two. The male possesses wings and is fond of flight, and he also has large eyes. It is, therefore, considered that the male is aided in the search for a mate by means of the beautiful phosphorescent light that is emitted from the lower surface of the hind portion of the female's body. In like manner, if the female wishes to attract a male she lights her fairy lamp, and the deed is more easily accomplished.

The insect exhibits considerable power over this luminosity, for it can be increased, decreased, or put out altogether, as the creature desires.

Thundery weather on a Summer's night is a good time to observe these Beetles in a good Glow-Worm district, for the electricity in the air seems to have the effect of brightening the light given off by this insect lamp-lighter. The larva should be sought for during the Autumn. It is a useful creature, feeding upon snails. It also exhibits luminosity, but not to the same extent as the adult female. Even the latter is somewhat larva-like in appearance. She is a flattish, grey-coloured creature, but may at once be distinguished from her mate by the absence of wings.

Our knowledge of this Beetle seems to me very limited, and there is a good deal more to be learned concerning it. Being

nocturnal in its habits, it does not, of course, lend itself to close and intimate study, but careful observation by the young Beetle-hunter should reveal many interesting points in connection with it of which we are at present unaware.

**Death-Watch.**—This small brown-coloured Beetle is the species which, of a quiet evening, one may hear tapping in old furniture, behind the skirting of a room, and other places. The so-called “ticking,” which is *supposed* to presage the death of a person, is caused by the male knocking his head against the wood. But what is the insect doing in these household articles? the young reader may ask. Its mission in life is to pulverise wood, and great havoc is carried out by this small insect in valuable old furniture. It tunnels its way through the hard wood, and reduces same to powder. The noise that one hears may be caused whilst the energetic creature is at work, but it has been stated that the curious “ticking” is a call from one sex to the other.

**Oil Beetle.**—Early in the Spring it is more than likely this species of Beetle will be seen crawling slowly and laboriously across a pathway. It is a long insect, measuring about  $1\frac{1}{2}$  inches. It is dull blue-black in colour, but may at once be identified by the length of the abdomen, and the wing-cases appearing too small to cover the latter part of the body. When taken in the hand this species has the habit of emitting drops of yellowish oil from the joints of its legs; hence its English name of Oil Beetle.

The female deposits a large number of eggs on some favourite bankside, a crevice in the earth being often taken advantage of. The grubs are small, and crawl into a flower, and so accomplish a very wonderful thing. And what do you think that is? Having found a snug resting-place in the very heart of some wayside blossom, the creature stays there until a Wild Bee comes to pursue her sweet pillaging. The grub then contrives to become enmeshed in the hairs on the Bee's body, and, having accomplished this, waits until the Bee flies away to her home.

The unsuspecting Bee, having gathered pollen from the flower, proceeds to a cell in the nest, deposits the pollen in the

cell, where also there is an egg. But the Bee has reckoned without the crafty Oil Beetle larva, for the little creature also contrives to secure lodgment in the cell. More food is placed in the cell for the larva of the Bee to feed upon when hatched, and eventually the Bee, satisfied with the result of her mission, goes about her business elsewhere. And what does the Meloë grub do? In the first place, the egg of the Bee is eaten, then it casts its own skin and loses its legs. After this the food placed by the Bee in the cell for her own offspring is devoured by the Oil Beetle larva, and, having eaten sufficient, it pupates. A period of inactivity is then undergone, and eventually the chrysalis breaks asunder, and the adult Beetle comes forth, after having enjoyed a very peaceful and happy sojourn in the world without any apparent effort on its own part to secure its own living.

**Weevils.**—This is a very large family of Beetles, no less than 20,000 or more having been recorded. The chief distinguishing feature is the head, which will be found to be prolonged into a kind of long, thin snout. At the tip of the snout the jaws are located. Weevils feed upon plants. The Corn Weevil commits sore depredations in granaries, and the Nut Weevil and the Acorn Weevil feed upon the fruit of the Hazel and the Oak. The larvæ are usually legless. They are white and fleshy, and have a wrinkled skin and bent bodies. These are extremely prolific insects, and it is stated on authority that a single pair have the capacity for producing a progeny of over 6,000 in one season.

**Musk Beetle.**—This fine Beetle is rich metallic green in colour, and may be at once identified by its long antennæ, as well as by the strong musky odour that it gives off. This odour may be detected at a distance of about 20 or 30 yards.

**Wasp Beetle.**—The young Beetle student might, on first acquaintance, mistake this species for the better-known Wasp. It has black wing-cases, banded with bright yellow. The larva should be sought for in old posts, fences, and similar places, where it feeds upon the solid wood.

There are several families of Beetles that have had to be omitted in this survey of a few of the British Coleoptera, such



as the magnificently-coloured Reed Beetles, the Bark Beetles, and others. We must, however, before passing on to the second order upon our list, briefly consider the Ladybirds.

**Ladybirds.**—The Ladybird Beetles constitute a very large family. They are characterised by their rounded, convex form, and generally shining and hairless bodies. They possess short antennæ, consisting of eleven segments, the end terminating in a club.

The hind body, as has doubtless been observed, is quite covered by the wing-cases. The legs are short, and well hidden under the body.

Two of our commonest British species are the Two-Spot and Seven-Spot Ladybirds. Both these—in the larval and perfect states—are common in gardens, and especially where roses are grown. They feed upon the Aphides, and another kind tenants hop-gardens for a like purpose.

The amateur rosarian would do well to encourage and protect these highly beneficial insects, for there can be no doubt they are to be numbered among his best friends. He would do well, too, to make himself acquainted with the larva of this creature, for I have found the amateur gardener (and some professionals, too) to be too fond of destroying every living creature that infests his precious floral treasures. The Lace-Wing Fly, about which we shall have something further to say later on, is often destroyed in this way.

The larva, then, is smoky-black or greyish in colour, marked with yellow or orange and white. It is an active creature, and possesses six-jointed legs in front. The body is slightly hairy and rough. The pupa is black and creamy-white in colour, and short and stumpy in form.

Most species of Ladybirds are black and red or black and yellow. The Eyed Ladybird, which is such a boon in hop-gardens, bears eight black spots on the wing-cases, and these are surrounded with a yellow band.

The eggs are creamy-white, and are laid in clusters in the Spring on various plants.

One Spring-time a boy brought me a Ladybird Beetle, evidently a queen fresh from her hibernating haunt. A few

children were gathered round me at the time, and I seized the opportunity of giving a short lesson on the useful creature. One fact—namely, that Beetles (or, at least, some kinds) eject a fluid for protective reasons—was admirably exemplified. I had the insect on my hand, and tapped its back with a pencil to show my young audience how it tucked its feet away, and the irate little creature showed its dislike at my unwarrantable intrusion by squirting its fluid, of a heavy orange colour, on my hand. The sensation was distinctly a burning one, and I felt inclined to drop the insect and rub the offending fluid off. Then I suddenly refrained from doing so, and described the sensation to the expectant and interested gathering around me. The question then arose as to the enemies on which the Ladybird would be most likely to turn her weapon, and we thought of a bird which would be calculated to drop the insect quickly when the latter gave it a drop or two of her “home-made mustard”! Then I remembered the interesting fact that insects coloured a brilliant red, such as this one under consideration, the Cinnabar Moth, and the Six-Spot Burnet Moth, for examples, are not eaten by birds, or rarely so, the colour acting as a danger signal, and the immunity from attack from that quarter not requiring them to be fast flyers. Have my readers any knowledge or opinion on the subject? for it is one of my aims in this book to invite assistance on any interesting question that may arise.

#### Order II.—STRAIGHT-WINGED INSECTS

The insects constituting this Order are few in number, but among them are several well known by sight to most people, such as the Earwig, the Cockroach, the Cricket, and the Grasshopper. Generally speaking, the fore wings are of a parchment-like texture, and the hind wings are folded beneath them after the manner of a fan in several of the families. In others, however, such as the Earwigs, a different method prevails. In these the wings are tucked away more as in Beetles.

Whilst many of these Straight-Winged Insects are vegetarians, others are not so strict in their dietary, and partake of

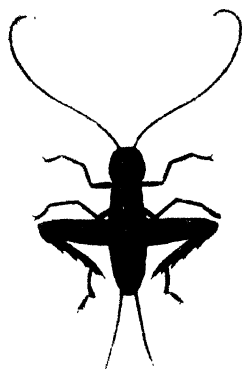
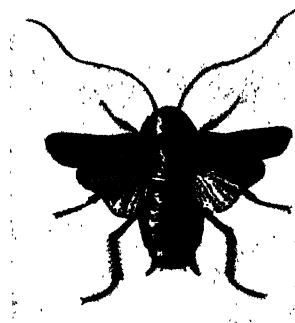
both vegetable and animal food. They differ from many other insects by having an incomplete metamorphosis—that is to say, they do not undergo an inactive condition when in the pupa state. When hatched, the young bear the likeness of their parents, but, before assuming the adult form, pass through a series of moults. Just previous to the final cycle, the rudimentary wings make their appearance in those kinds which eventually possess these appendages.

**Earwig.**—Most people seem to have a distinct abhorrence for this insect, and why this is exactly I have long failed to understand. The creature, by turning up the end of its abdomen in such a formidable manner, is certainly calculated to strike terror into the heart of a lady who is timorous, and, being usually regarded as a beastly, crawling creature, does not tend to improve it in the estimation of many.

It will be as well to deal with the habit the Earwig possesses of turning up its hind portion before proceeding further. This is stated to be for the purpose of folding and unfolding the wings, whilst another suggestion is to the effect that the habit has something to do with the method adopted for sexual union. It appears to me that neither of these theories is satisfactory, although I am bound to admit I cannot suggest any other.

The reader will doubtless have noticed how this insect can, by means of its forceps, hang on to the finger of a person. The male always possesses larger “pincers” than the female. Some kinds of Earwigs are wingless, but our common species, known to everyone, has ample wings, which are, however, rarely used. The wing bears a striking resemblance to the shape of a human ear.

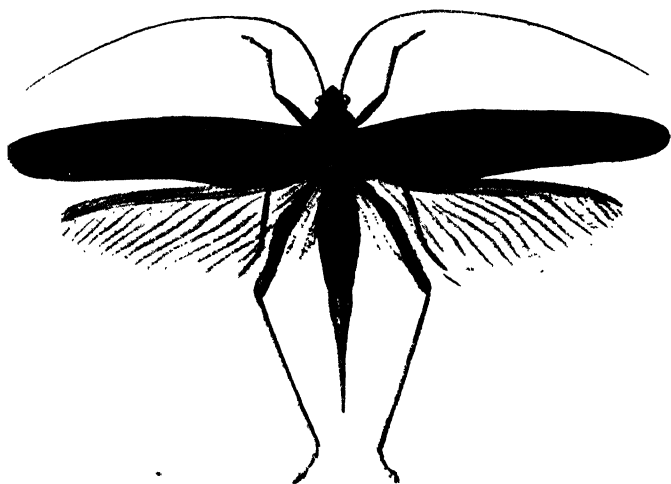
This is mostly a nocturnal insect, hiding during the day among stones, flowers, crevices, posts, under the bark of decayed trees, and other places. When located during daylight, the Earwig evinces a keen dislike at being disturbed, and makes haste to find some spot where it can hide its body. It is a wonderfully quick traveller upon the ground. It is a vegetarian, as those who grow Dahlias well know, and at night-time it climbs plants in search of food. It is also stated



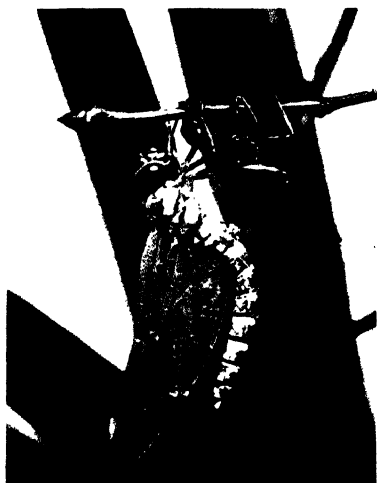
HOUSE CRICKET

COMMON GRASS HOPPER

*PLATE LXVIII*



GREAT GREEN GRASSHOPPER



DRAGON FLY JUST EMERGED

to partake of an insect diet, and is not exclusively a vegetable feeder.

The general appearance is too well known to need detailing, but it should be stated with emphasis that, unlike most insects, the female Earwig does not deposit her eggs and take no further heed of them; for she constructs a depression in the ground, lays her eggs, broods upon them, hatches them off, attends to her young brood, and generally acts very similar to a hen with her chicks! This is a very uncommon habit in the insect world, and, distasteful as this creature may be in many ways, the trait in its character just referred to is very interesting to reflect upon. The eggs are minute, and like small grains of sand. They are deposited in the ground, and the mother Earwig evinces a solicitous welfare for her young which is especially to be commended.

The forceps vary in size and shape in different species, and the young entomologist would do well to carefully note these differences for himself. In some Summers Earwigs appear very prolific, and whole armies invade our gardens and houses, searching out the hair-brushes and other articles in the bedrooms, much to the discomfiture of the tenants.

Whilst a few instances of the Earwig crawling into the ear of a person have come under my own notice, it does not appear to me that this insect carries out this habit to any appreciable extent, beyond which, being almost exclusively nocturnal in its habits, I do not exactly see when it accomplishes this remarkable feat.

**Cockroach.**—This is another lover of the silent watches of the night, and its flat brown-coloured form will be known to most people. An American species inhabits warehouses, ships, and other places, and has spread to most parts of the world. Has the reader ever tried to catch a Cockroach when it is running? It is very swift and active in its movements, and very fond of warm cupboards, bakehouses, and similar haunts. It is to be regarded as a household pest, and I remember as a boy being interested each morning in counting the specimens strewn upon the floor of a warehouse, the insects having tasted of some powder sprinkled overnight with dire results.

Some individuals will be observed which have the wings in a half-developed state. These are the perfect females. In some other kinds, however, much diversity exists, for the wings are found to be fully developed in both the male and the female. In other species the male is winged and the female wingless, and others, again, in which both sexes are devoid of these appendages.

Too generally known as a Black *Beetle*, it should be pointed out that the Cockroach is not a Beetle at all!

Sixteen eggs are laid by the female during the Summer, and these are contained in a purse-shaped capsule. The latter is placed in some convenient place, and then she leaves her eggs to hatch without any effort on her part, thus differing greatly from the Earwig in this respect. When the young appear they are almost colourless, the eyes only being black.

It is not until the fourth annual birthday has been passed that the Cockroach acquires the perfect form. It passes through a succession of moults by casting off its skin. This is accomplished by the middle of the back of the segments on the thorax being split asunder. When the creature emerges from its old body covering, it is pale in colour and soft to the touch. It soon hardens, however, and then assumes the dark chocolate colour known to most people:

**Mole Cricket.**—This Cricket is less known than the two species that follow. It is the largest of the three, a brown insect of about 2 inches in length. The great feature is the very broad and flat front legs. These are used for burrowing in a similar manner to those of the Mole, hence the forepart of the English name.

Crickets are, as is well known, famous for their curious vocal efforts and leaping powers. They possess long hind legs, with thick thighs.

The female generally possesses a long ovipositor (in the present species, however, this organ is short), and the feet usually have three joints.

As regards the Mole Cricket, this species is probably more common than is supposed, for, being an underground animal, it is not often located.

It resorts to fields and gardens, and whilst some writers state that it is, like the other Crickets upon our list, a vegetarian, others venture the opinion that it is carnivorous.

**House Cricket.**—This is a much smaller species than the last-named. It certainly resembles it in colour, but is only  $\frac{1}{2}$  inch in length.

As its name implies, it inhabits our houses, and its cheery, although at times monotonous, love-song will doubtless be well known to the reader. It is one of the few noisy animals that infest our homesteads. The colour of this insect is brownish with some black markings upon the head. The eyes are black and very prominent. The female, unlike the Mole Cricket, possesses a long ovipositor, and by means of this she deposits her eggs in any convenient crevice. The larva is wingless, but when the pupa state is entered into rudimentary wings may be discovered. It is the male Cricket who utters the sibilous love-song, as the female does not possess the necessary apparatus wherewith to do so.

This insect would amply repay close examination under a glass, and as it is such a common species I would strongly recommend the young student to procure a specimen and examine same for himself.

**Field Cricket.**—This Cricket is black in colour, and resorts to grass fields situated in sandy districts where the soil becomes well heated by the sun. Here it burrows underground. It is a stouter and bolder-looking species than its household relative, and is rarer.

Although these Crickets possess wings, and are capable of flight, they rarely seem to appear upon the wing, resorting to the more usual methods of burrowing and prodigious leaping.

It should be noticed that Crickets, Grasshoppers, and Locusts possess remarkably perfect ears, and also, as is well known, organs which emit the chirping sounds. I will tell you shortly how the Grasshopper of our field produces its note. The Cricket has what is known as a stridulating file on the under surface of the left fore wing, and the friction caused by bringing this appendage quickly over a ridge on the right wing cover results in the production of the chirp known to almost everyone.



**Great Green Grasshopper.**—This, our largest British Grasshopper, should be sought for among long grass and low bushes. It belongs to the Long-Horned Grasshoppers, the smaller and commoner kind next to be described claiming kinship with the Short-Horned Grasshoppers, or true Locusts.

These Long-Horned species possess four joints to their feet; the female is distinguished at once by her long ovipositor, and both sexes bear very long and slender antennæ.

The Great Green species is, as its name indicates, green in colour, and may be found leaping adroitly among tall grasses during Summer and early Autumn. The hind legs are very long, and the knee-joint is swollen into a large round knob. The insect is about 2 inches in length, and an interesting time may be spent watching these creatures pursuing their active manœuvres. The young naturalist would do well to catch a specimen and examine it, for, although so energetic, I find specimens very willing to remain perfectly still when placed in the palm of the hand. A strong magnifying-glass should be carried in the pocket, and by means of this the remarkable detail upon the Grasshopper's body may be seen to advantage. The eyes are large, and remind me as I look at them of those of the Woodcock among birds—that is, as regards the position they occupy at the top of the forehead. The beautiful pattern-work upon the sides of the thighs is better seen than described, and various other details will be revealed when the insect is looked at through a glass which are not presented to view when examined with the naked eye.

**Common Grasshopper.**—Although this little species, as has already been mentioned, belongs to the Locusts, some species of which commit such terrible havoc among growing crops, grasslands, and the like in foreign and colonial climes, in England very little appreciable damage, if any, appears to be perpetrated.

The chief haunt of this Grasshopper is a grass field, or grassy wayside. Here the little chirper passes the day hopping and falling about in a series of interesting movements, feeding upon the surrounding green herbage, or depositing eggs. These latter the female lays in the ground, making an incision through

the agency of her short, stout ovipositor. Having laid the eggs, she hastens to hide them by covering them with a fluid secretion. This eventually hardens into a kind of irregular capsule.

Whilst it is generally admitted that these Grasshoppers partake very largely of a vegetable dietary, some of them are cannibals, for I have known a specimen placed in a box among Moths to greedily devour the latter.

I promised to explain how this insect carries out its "chirping" noise. This is accomplished by the creature scraping rows of pegs, which will be found on the inside edge of the back thighs, over the acute edge of the nervures of the fore wings. It is most interesting to watch this operation carried out, but the observer must be keenly sighted if he would be entirely successful.

My reference books fail to satisfy me with regard to the colour of these Common Grasshoppers. Do the light brown, dark brown, pale green, green and red, and other specimens one sees in grassy places all belong to the same species? If so, then they exhibit marked variety about which there seems to me a great deal to learn, and I strongly invite the reader's attention to this matter if he is sufficiently interested.

**Red-Legged Locust.**—We are not troubled in this country to any extent with the visitation of vast hordes of migratory Locusts who carry devastation with them wherever they go, and eat up every green thing with which they come into contact.

These migratory Locusts are only casual visitors to England, and the Red-Legged species is the commonest. It expands from 2 to 4 inches, has grey wing-cases varied with brown, light green hind wings, and red on the hind shanks, with white spines tipped with black.

When migrating, these Locusts travel in countless numbers, sometimes a flock extending over an area of some miles. Every green blade of herbage is consumed as the great insect army invades the countryside. The females deposit their eggs as they proceed, and the young (who are wingless) perpetrate as much damage as the adults. Whilst many exaggerated

accounts of the ravages of these migratory Locusts appear in the newspapers, an accurate and fully authenticated record of the visitation of a huge number to Southern Australia is set out by a relative of mine in "The Story of Insect Life," to which attention is directed.

### **O. der III.—NERVE-WINGED, OR LACE-WINGED, INSECTS**

The insects belonging to this Order are characterised by the structure of the wings. If the wing of the Common Dragon Fly, or May Fly, be examined, for instance, it will be found to be made up of a number of horny veins as a sort of skeleton, and between these there are delicate veins of a very beautiful description.

These Nerve-Winged insects are split up into two large groups, the first containing those in which the pupa remains in an active condition, and in the second group the pupa is inactive, as in the better-known Butterflies and Moths. The first group, then, contains the Dragon Flies, the May Fly, the Termites (insects restricted to warmer countries than our own, especially Australia), and a few others. The second group numbers among its members the Flat-Winged insects, and the Hairy-Winged insects, such as the Ant Lion of Southern Europe, the Mantis Flies, the Snake Flies, Scorpion Flies, Lace-Wing Fly, Alder Flies, and Caddis Flies. Of some of these we have no British representatives, but it is as well to mention them so that our list may be fairly complete. We may now set out the chief distinguishing features of the Dragon Flies.

**Dragon Flies.**--Aptly termed the Eagle of the insect world, the general life-history of the Dragon Fly is very imperfectly understood excepting by those who study it. Most people, for example, are of opinion that it stings, whereas it may at once be stated that the insect does not possess a sting wherewith to do so!

We have as many as forty or more species of Dragon Flies in our little island, but of these it is quite impossible to treat within the limits of this volume. It is best, therefore, to give some information concerning the general life-history of the

Dragon Fly, and to conclude by describing three or four of our commoner kinds.

The food consists almost exclusively of insects, and these Dragon Flies are cannibals. Place two larvæ in an aquarium at home, and, if your experience be similar to mine, it is more than likely one of the specimens will suck the body of its fellow perfectly dry, and only leave the larval case remaining.

The eggs are laid in the water, or on plants very near it, and the larva, or grub, is a remarkable adept at insect-catching. It is generally dull grey or brownish-green in colour, and is notorious because of the curious "mask" which it possesses. This apparatus partially envelops the lower part of the head, and is made up of two joints. These latter fold upon one another, but can be extended as the creature directs. The outermost joint ends in a pair of strong jaws. When feeding, the larva swims under the victim's body, and then seizes hold of it with the powerful jaws. This accomplished, the "mask" is folded up, the unwary victim is brought towards the mandibles, and the latter do the rest.

In swimming, too, the larva of this remarkable insect exhibits many interesting feats. The Rev. Theodore Wood, to whose delightful account of the Dragon Fly I am largely indebted, states that "through the centre of the body runs a longitudinal tube, terminating in a circular orifice, closed by means of five tightly fitting valves. These valves, which together form a sharp spike when closed, can be separated at will. When the insect wishes to swim, it fills the tube with water, and then squirts the contents forcibly out, the result being that it is driven swiftly forwards by the reaction."

The adult Dragon Fly is a remarkably strong flier, swift of wing, dexterous in movement, and vastly interesting to watch. It pursues insects in the air with great adroitness, and is especially fond of hawking over ponds and streams on a hot Summer's day. It loves the heat, and no matter how scorching the sunshine may be the bold Dragon seems to revel in it, and pursues his airy way unhampered.

The pupa resembles the larva, but an examination of the former will reveal the presence of rudimentary wings. It is a

fine sight to behold a Dragon Fly emerging, and the young naturalist would do well to pay attention to the rushes and other herbage in the neighbourhood of ponds and streams in the hope of locating one or more of these predatory creatures in the act of coming out of its so-called pupa case. When it does, it will be observed how very closely the old case resembles the perfect insect. A great deal more might be stated concerning these most remarkable members of the insect world; but we must now pass on to describe a few of our commoner kinds.

**Great Dragon Fly.**—This species measures about 3 inches long, and about 4 inches across when the wings are extended. It is light rusty-brown, marked with a paler colour.

**Horse-Stinger.**—This is a very common species, and in spite of its name, is harmless excepting to the insects upon which it preys. It may be identified by the flat dull yellow body in the female, and blue in the male.

**Demoiselle.**—This is a beautiful little Dragon Fly, the male being deep blue, with black patches on the wings. The female is green.

**Calopteryx Virgo.**—When I was naturalising in a Sussex wood not far from Ashdown Forest last Summer, I made the acquaintance of a very lovely Dragon Fly which, so far as I know, does not possess any English name. The Latin name is *Calopteryx Virgo*. The male has deep metallic blue on the head, abdomen, and wings, whilst the female is brilliant peacock-copper on the head and abdomen, and russet colour on the wings. I saw several specimens of both sexes, and was attracted to the males by the dark coloration and curious flight. Unlike the Horse-Stinger, *Calopteryx* was quite an easy species to capture—indeed, remained perfectly still whilst I examined it, and thus made capture unnecessary.

Dragon Flies, it should be noted, in conclusion, possess large globular eyes composed of some thousands of facets, or lenses, and one of these visual organs should be examined under a good glass.

**May Fly.**—This beautiful little insect is closely related to the Dragon Flies. It seems strange that although the May Fly

takes at least two years before it assumes the adult state, it then lives for a few days only, and often only a few hours. I have seen dozens of the creatures emerge from holes in a bank by the water-side, only to be snatched up by a Swallow, or a large Trout, within a few seconds. The young spend their time in curved burrows in the banks of ponds and streams, and these have two entrances, one above the other. Soon after the perfect May Fly has attained maturity it changes its skin. Before this happens it is known as the "Green Drake"; after it has been performed it is called the "Grey Drake."

There are a large number of species, but the two commonest British kinds are *Ephemera vulgaris* and *E. danica*. The wings are remarkably delicate and beautiful, and should be examined through a glass. The female lays her eggs in the water, and these are much relished by fish and other aquatic creatures. The three curious "tails" situated upon the abdomen of this insect cannot fail to arrest attention, and add to the weird effect the May Fly exhibits when dancing in jerky flight down stream.

**Snake Flies.**—Between the May Flies and the Snake Flies come the Termites, or "White Ants," the Ant Lions, and the Mantis Flies. We have no British representatives of these, so that we now arrive at the present section. These are also known as Camel Flies. The large head is joined to the thorax by a long neck. This results in the insect possessing, as the Rev. Wood points out, great freedom of motion. Generally the neck is raised and the head lowered, so that a distinct snake-like appearance is presented. From this habit the English name of Snake Fly has been acquired.

These are predatory creatures. We have only four species on the British list, and they should be sought for in the same surroundings as the May Fly. The larvæ, however, pass their time underneath the bark of trees, and throw themselves into most extraordinary positions, and so do their part to keep up the reputation of the adult insect.

**Scorpion Fly.**—The Common Scorpion Fly is shining black in colour, with yellow legs and transparent wings, spotted with brown. It measures about  $\frac{1}{2}$  inch long.

The female deposits her eggs beneath the ground, and the young, when hatched, feed upon various decaying vegetable matter, and pursue an underground existence. Having eaten sufficient, the larvæ exhibit a desire to possess a still more subterranean life. They burrow deeper into the ground, and there pupate. In about fourteen days the perfect insect emerges.

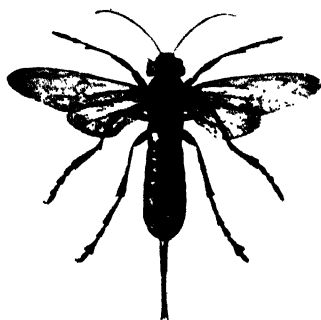
The latter is characterised by the possession of a curious structure at the end of the body. This is prolonged into a kind of slender, three-jointed appendage. Beyond this, the male has a pair of curved forceps. From this structure the name of Scorpion Fly has been derived. It is a harmless species in spite of its Scorpion-like structure, living upon other insects that are frequently found to be larger and stronger than this interesting creature. It is an active and engaging insect, and during the Summer numbers may be observed resting upon herbage along a country lane, or running about on the foliage of small bushes and similar places.

**Lace-Wing Fly.**—A great friend of the Rose-grower and the horticulturist, this beautiful mazy little insect deserves every encouragement. It is not only a beautiful but a beneficial species. Although it may be observed during the day, it comes forth towards the gloaming hour to pursue its operations. It is pale green in colour, and the remarkably beautiful eyes, when seen in a good light, shine like burnished jewels. The wings are very closely and delicately veined, hence the popular name of Lace-Wing. It seems curious that although such a lovely creature it should possess the habit, when handled, of emitting a liquid of a very strong and disagreeable odour.

The female fly deposits her eggs upon a leaf or twig, first taking the precaution to place upon same a drop of sticky substance. This accomplished, the remarkable creature contrives to jerk her body upwards, and, as she does so, the glutinous fluid is drawn out into a kind of slender thread. The fluid quickly hardens, and as the female approaches the end of the "thread," she lays an egg, and attaches it to the tip. As many as 200 or 300 eggs are laid together in this way, the whole colony presenting a very curious appearance.



FACEWING FLY



LONG-TAILED WASP



HOUSE FLY, LARVA AND CASES



WOOD ANTS  
a Male b Female c Worker







The larvæ feed upon Plant Lice (and especially Aphides), and have the habit, after sucking dry the body of the victim, of attaching the skin to their own backs. At first sight this may appear a very singular and inexpedient action on the part of the Lace-Wing larva; but it is wonderful to relate that the "scalp" of the victim materially protects the Lace-Wing grub by hiding its body, and when several skins have been attached to the larva's body, only the jaws and feet are discernible.

The pupa is contained within a cocoon of silk, and it only takes a few days for the perfect insect to emerge as the airy and beautiful little animal we know it to be.

**Alder Flies.**—We are considering just now quite a number of insects which make their home in and around the water. It is there the present Flies should be looked for. These are not airy creatures, the flight being slow and heavy. Somewhat like the Caddis Fly, next to be described, the Alder Fly may be distinguished at once by the wings *not* being longitudinally folded when the insect is resting. The eggs are deposited on the leaves of aquatic plants, 300 or 400 being laid in a cluster. When hatched, the small larva goes down into the water, and creeps about the muddy bottom in quest of food. Small creatures are preyed upon, and that an abundant supply of food is forthcoming is evidenced by the full-grown larva, the same measuring about 1 inch in length. After this stage has been reached the water is vacated, and the larva buries his body in the ground for the purpose of pupating. Eventually he emerges as a perfect insect about Midsummer.

**Caddis Flies.**—We have a number of species of these remarkably interesting Flies, and their habits amply repay close observation. The perfect insect is not a really good flier, the flight being slow and somewhat laboured. This seems curious when one remembers that the wings appear well suited for a strong and well-sustained flight, the same being broad and large.

The female Caddis Fly deposits her eggs in the water, and the larva, when hatched, is notorious for the home it constructs in which to pass the larval and pupal states of its existence. The materials used for these often beautiful little cases vary

according to the species, and it would be well if the young naturalist is searching for a branch of natural history in which to specialise to choose this most interesting group of insects.

Some kinds use little pieces of stick and leaves; others use leaves entirely, fastening them together to form the elongated case by means of some sticky secretion; a further species uses sand and small stones; and still another kind actually adopts the shells of small Water Snails, the owners very often still frequenting them. The front portion of the body of the larva will be found well protected, but if a specimen be detached from its home, it will be noticed that the hind part of the body is soft, and requires protection. Thus the creature constructs these wonderful little habitations, and these, like those of the Snail, are dragged about with them, the Caddis Fly larva progressing by means of some of the legs being poked out of the front door, so to speak. I have found large numbers of larvæ, however, who attach their cases to stones, posts, pieces of wood, aquatic weeds, etc., and these do not apparently travel about. This perhaps is restricted to certain species unknown to me.

When the larval condition is at an end, the ends of the case are sealed up, and the pupal state is entered upon. It only takes a few weeks for the perfect insect to form. The creature, having almost reached maturity, leaves the water, and rests upon the herbage surrounding the old home. It practically spends all the remaining time either in or around the environment where its remarkable metamorphosis has been carried out.

The larva is a vegetarian. In colour it varies from light to dark brown. The tail bears a pair of pincers upon it, and by means of these it retains a hold of the case when an endeavour is made to detach it from the stronghold. In this way, and also by reason of the protection afforded when within the case, the Caddis Fly larva and pupa are both well protected, and are calculated to supply a fund of interest and wonder to all those who will take the trouble to examine them.

**Order IV.—HYMENOPTERA**

This very important and large Order is divided into two sections—one containing those species who utilise the ovipositor as a saw or an auger, and the other those insects in which this appendage is modified into a sting. Among the former we shall shortly make the acquaintance of the “non-stingers,” such as the Saw Flies, while among the “stingers” are the Ants, Bees, and Wasps.

It will have been noticed that the insects belonging to this extensive Order possess four membranous wings, but these do not exhibit the remarkable delicacy of structure so characteristic of the Nerve-Winged or Lace-Winged group that we have recently been considering. The *Hymenoptera*, or many of them, are large insects, but in spite of this possess small wings. These, however, are capable of being locked together during flight. Thus it comes about that these insects are strong and rapid fliers. It should be stated that there are many other kinds of insects allied to the better-known Ants, Wasps, and Bees, such as Saw Flies, Gall Flies, and Ichneumon Flies, many of which are of small size.

An important distinction among these members of the *Hymenoptera* is their solitary and social habits, and of these we shall learn something as we proceed to deal with the life-history of each species. It is unnecessary in this portion of our work to set out the metamorphosis which is undergone, as this will be detailed when we come to the Hive Bee, so that we may now proceed to consider a few of the commoner kinds of insects in the more important families.

**Saw Flies.**—Horticulturists have too close an acquaintance with some of these insect pests, such as the Gooseberry Saw Fly, the Currant Saw Fly, and the Pear Saw Fly. They perpetrate an immense amount of damage in gardens and orchards, and the first-named insect especially has often caused me to consider it far from interesting when it has literally stripped my Gooseberry bushes of their leaves, and made them look very sorry objects indeed.

There are over 2,000 different kinds of Saw Flies, and these

are characterised by the ovipositor, or boring apparatus, being modified into a pair of toothed saws, by means of which the insect is able to make an incision in a leaf or in the bark for the purpose of depositing the eggs. The species which devote attention to Currant and Gooseberry bushes measure about  $\frac{1}{2}$  inch across the wings. The colour is yellow with a black head, antennæ, and three elongated spots on the back. The transparent wings are veined with black.

The larvæ are bluish-green dotted profusely with black, and are often found to be gregarious. They possess twenty legs. The larva of the Pear Saw Fly differs from the last-mentioned by being more slug-like in form. It is yellow or green in colour, slimy to the touch, and the front part of the body is bulky. The adult insect is black with transparent wings, excepting the veins. The antennæ of Saw Flies vary a great deal, and would provide an interesting and absorbing study for the young entomologist, whilst the general life-habits of this large section of boring insects might well engage the devotion of a lifetime.

**Wood Wasps.**—These handsome insects (which should not be confounded with the *Vespidæ*, or true Wasps, known to everyone) are not very strong numerically. Perhaps the two best-known species are the Giant-Tailed Wasp and the Steel-Blue.

The female possesses a very strong and stout ovipositor upon her abdomen, and with this efficient instrument she bores a hole in a tree and there inserts her eggs. This ovipositor is frequently mistaken for a sting, but, as has already been shown, we have not yet reached the stinging insects, and the ovipositor of the creatures we are now considering is used for boring purposes. The larva of the Wood Wasp lives in the stems of plants, or in the solid wood in the very heart of some forest giant.

The Giant-Tailed Wasp is yellow in colour with two black bands. She is at once distinguished from the male by her stout ovipositor, which is half as long as the abdomen. The male is to be known by the absence of an ovipositor, whilst the end of the abdomen is tipped with black, and tapers off to a rectangular point.

The larva lives for varying periods before assuming the pupa state. On occasions, the latter condition is entered upon when the larva is about one month old, but others retain the larval state for several months, or even years. The larva is a fleshy creature. It has strong mandibles, but no eyes and very few legs.

Eventually the pupal state is undergone, but when the perfect insect emerges, the original hole in the plant or tree has become closed, and the insect has to bore its way out to obtain freedom. The boring powers of some of these larger Wasps are remarkable, for one has been known to bore a hole a  $\frac{1}{4}$  inch in diameter *through a lead sheet*  $\frac{1}{8}$  inch in thickness.

The Steel-Blue Wasp is not so large as the Giant-Tailed species. The female has a purple-blue abdomen, whilst the male is yellow with a black apex. The ovipositor is not so lengthy as that of *Sirex gigas*.

Were it not for the difference in size the male of both species might perhaps be confused, but this difference, and also the fact that the larger species possesses yellow antennæ, are amply sufficient to identify one from the other.

**Gall Flies.**—The enormous number of Gall Flies which we possess has been amply demonstrated to me many times during my country wanderings, but never with greater emphasis than during the past Summer (1908). I hardly remember, for example, seeing the Wild Rose galled so extensively, and some of the so-called "pin-cushions" have attained a tremendous size.

The Gall Fly responsible for the Bedeguar, or "Robin's pin-cushion," as it is more popularly known, is a small black insect, with some red below.

Having found a gall of this kind, detach it from the tree and cut it into sections. You will then have evidence of the cause of this most curious excrescence, for a number of cells will be seen towards the harder portion of the Gall, each containing a grub or larva.

What happens is this: The female Gall Fly pierces leaves, twigs, and other portions of plants and trees with her slender ovipositor for the purpose of laying her eggs. As may be

assumed, the result of this is that the portion of the vegetable tissue so punctured becomes irritated and inflamed, and a swelling takes place. This latter, then, is known as a Gall, and within a cell inside this the larva lives, as may be easily ascertained by the simple experiment I have suggested.

There are nearly 300 kinds of British Galls, and a careful search would doubtless reveal many more. Over fifty kinds are found upon the Oak Tree alone, and the Bullet Gall and the Oak Apple will be well known to the young reader. Then there are Cherry-like Galls which are of a bright red colour, very prevalent upon Maple leaves, and a very pretty Gall I noticed on the Willow recently was about the size of a marble, red above and yellow underneath. Most Galls are produced as a result of the work of Gall Flies, but some kinds of worms and fungi are also responsible.

With reluctance we must leave these vastly interesting insects, but not without extending to the young reader a warm invitation to take up the study of our British Galls, and so help to unravel some of the many mysteries connected with their production and their producers.

**Ichneumon Flies.**—We have a large number of parasitic insects in this country, and these are usually called Ichneumons. Among them are a number of very small species which, unless especially looked for, would certainly escape detection.

When it is stated that there are probably over 2,000 different kinds of these insects in England alone, it will be seen how difficult it is for us to deal in an adequate manner with any number of species. We can only hope, therefore, to set out the salient characteristics of these large insect families, dealing at greater length with any well-known member that occurs during the progress of our story.

Let it be stated at once that Ichneumons are useful parasites in several ways, and undoubtedly help to preserve the balance of Nature. A friend of mine recently procured from his Cabbages several larvæ of the Garden White Butterfly, the leaves being fairly riddled as a result of their ravages. He placed them in his larva "cage," fed the Caterpillars, and waited for them to pupate. This they apparently did, but, on

the insect emerging from the pupa, instead of a Butterfly an Ichneumon Fly came forth, and so told the story that when the Butterfly's larva was upon the cabbage plant a female Ichneumon had come along and laid an egg in the body of the Caterpillar. The egg hatched, and in due time the Ichneumon larva fed upon the body of its "host." Then, having eaten sufficient, it pupated, and used the old larval skin of its victim for this purpose. Such, in a few words, is the general life-history of these remarkable parasites.

Some Ichneumon Flies possess remarkably lovely and delicate wings, but as so many of these are minute organisms they must of necessity be examined under a microscope. Some Ichneumons are aquatic in their dispositions; some, as has been shown, are very small; others (and these are more typical) are larger, measuring about 1 inch across the wings. The colour is generally yellow or black. In some the ovipositor is short, in others it is very long. There is a species which is parasitic upon the larva of the Giant-Tailed Wasp already dealt with. It is as large as the Wasp itself, but more slender. It is black in colour, red on the legs, with two dots of white on each segment of the abdomen. Upon the extremity of the latter there are three curious thread-like appendages. This is the ovipositor.

**Ruby-Tailed Flies.**—Between the Boring insects that we have so far been considering and the Stinging insects, there come the Ruby-Tailed Flies. These are a small but brilliantly coloured insect family, blue, green, and bronze-red being among the colours possessed. The general colour is brilliant metallic green or blue, and the insect has doubtless attracted the notice of the young entomologist by reason of its loveliness. If examined, it will be observed that the Ruby-Tail has large depressions upon the thorax and a smooth abdomen. Like the Wood Louse (which, as we have already seen, is not an insect), these insects have the habit of rolling into a ball-shape when alarmed. They are, like the Ichneumons, parasitic, laying their eggs in the nests of various other insects.

Mr. W. F. Kirby relates a most interesting incident connected with this habit which is well worth repeating here. An ento-



mologist once saw a Ruby-Tailed Fly hurled to the ground by a Mason Bee which had built her nest in a hole in a wall. The Fly rolled herself up into a ball, when the Bee bit off her wings and then flew away. But as soon as she was gone the wingless Fly stretched herself out again, and climbed up the wall to the Bee's nest to deposit her eggs.

We now reach the second large group of the *Hymenoptera*, known as Stinging insects, and this at once introduces us to the Ants.

**Ants.**—The Ant passes through very nearly the same change or metamorphosis as does the Bee, shortly to be described. The eggs are very small, white or pale yellow in colour, and hatch out in about two weeks. What are popularly called Ant's eggs are not eggs at all, but the pupæ of the insect.

The Working Ants take care of the pupæ, carry them about from one part of the nest to another, in order that they may live in a suitable temperature, and assist a fully developed pupa to make its escape from the cocoon. The nest of the Ant is called an Ant-hill. It is made of various materials, and in all sorts of places. A nest sometimes contains from 5,000 to 50,000 Ants.

Ants live in societies, and are divided, like Bees, into three classes—Females, Males, and Workers. The females and males have wings, but not the workers. The males do not work. In Winter most Ants go to sleep at the bottom of their nests until the cold weather is over. Their food consists of honey, the sweet juices of plants, and small insects. Their chief use in Nature is to keep down the increase of small insects and reptiles, and to eat refuse matter which, if left, might contaminate the air. These insects are very active and strong when one considers their size, for even the small ones are capable of lifting and carrying objects many times their own weight, without appearing to be tired or in any way impeded.

It is generally recognised that these Ants are to be numbered among the most intelligent creatures we possess, and when one comes to consider the habits of the different species, and the methods they adopt for their survival, the interest deepens,

and one is continually finding out something fresh when probing into the secrets of Ant-life.

Some kinds keep their slaves, others have their guests. Some species, when not occupied in the more important work which it is necessary for them to perform, actually engage, so it is believed, in various sports and pastimes. Some are idle and indolent; many are active, engaging, and most industrious. The former have for so long a period taken advantage of the labours of others that they have through generations lost the power of tending themselves. Some are sociable, others are much the reverse. Generally speaking, however, the Ant is of a very sociable disposition, and there are not a large number of solitary kinds.

The hillocks of earth, twigs, etc., which some Ants construct will doubtless have arrested the attention of the young naturalist, more especially the large mound built by the Wood Ant. When it is remembered that this comparatively huge citadel is built up by such small creatures, it is a remarkable testimony to their energy and perseverance; when, moreover, the inside of the structure is revealed, and the various chambers, galleries, and tunnels are looked at, then one is able to appreciate one of the reasons why Aristotle praised the Ant's sagacity and Cicero ascribed to it mind, memory, and reason.

The Wood Ant is our largest British species. It is reddish-brown in colour, and, as has been stated, the male and female both have wings. The female, however, soon sheds these appendages after the nuptial flight is over. The Worker Ant is wingless. The abdomen of the male is more extended than that of the female; to put the matter in an understandable way, the abdomen of the male is shaped somewhat like that of a carrot, and that of the female like a turnip.

The Robber Ant is a robber by nature as well as by name. He contrives, and with success, to steal the food of other species. Another kind, that lives in narrow galleries below ground, enters the wide runs of the Brown Meadow Ant and secures food.

Some Ants are very fond of the Aphis, or Green Fly, or rather of the sweet fluid that they exude. This is the reason

Ants are found upon Rose bushes and other plants and trees infested by these Aphides. The Ants actually "milk" the Aphides for the purpose of securing this fluid, and will even carry them to their citadels and there tend them.

**Hornet.**—This, our largest true Wasp, is a fine British representative of the Burrowing Wasps. Many of these are solitary in their habits, but the Common Wasp known to everyone is, of course, gregarious, and the same remark applies to the handsome species now under review.

The Hornet belongs to the same family as the Wasp, but is much larger and stronger. Its nest is frequently found in hollow trees and crevices in walls, and is built of a kind of paper which the Hornet (as well as the Wasp) itself makes from bits of wood and bark. This paper is made by grinding up the fibres of the wood into a pulp in the mouth, and then spreading it out in thin layers to dry. The outer walls consist of many layers of paper, and the cells inside, which are like the cells in the honeycomb, are made in single horizontal combs with the mouth of the cell pointing downward. The insects lick the sap of trees, and have a great liking for sweet things, such as the juices of fruit and honey; they sometimes eat small insects, especially Flies. The Hornet does not gather honey itself, but steals it from the Bees.

Hornets live in societies, consisting of Males, Females, and Workers, just like Bees, and the young pass through the same changes. The females and the workers do all the work; they are armed with sharp stings, which inflict a very painful wound. A Hornet's nest generally contains about 200 insects. They go to sleep on the approach of Winter, and most of them die of cold; but a single female, having survived in some sheltered hiding-place, begins the formation of her nest in the Spring, and also to lay her eggs. There are several females in a nest, and they are the only ones who outlive the Winter.

**Common Wasp.**—Wasps are generally more slender than Bees, and less hairy. There are about 1,000 different kinds of Wasps, and they are found in every part of the world.

The Social Wasps consist of Females, Workers, and Males, but the Solitary Wasps are usually of two kinds only, Male

and Female. Almost all the Social Wasps are killed by the cold in Winter, but a few females who have buried themselves in the ground sleep there until the warm days of Spring arrive, when they wake up and lay eggs for the next Summer colony. The nests of these Social Wasps are usually built up of cells made of a kind of paper, and are quite as wonderful and intricate as that of the Hive Bees. They are placed in all sorts of positions—sometimes in the hollow of a tree, sometimes in the ground, sometimes hung from the branch of a tree, according to the kind of Wasp, and both the Hornet and the Common Wasp often build in the eaves of houses. The size of the nests vary much, from a few inches to several feet in length. The eggs of the Wasp pass through the same changes as those of the Bee. When the first brood is fully grown, they at once begin assisting the mother to make more cells; the females lay eggs, more workers are born, and as Autumn grows near, eggs are laid which produce females, and finally eggs for males.

The food of the Wasp consists of the juices of sweet fruits, the nectar of flowers, and honey-dew. Some kinds live upon insects, larvæ, Spiders, and even the dead bodies of larger animals. The females and workers have a very powerful sting.

Sand and Wood Wasps belong to the solitary kind. The female digs out a cell in rotten wood or in the ground, and lays an egg in it. A living Spider or some other insect is caught and stung till it is numb; it is then put into the cell, which the mother closes. When the larva is hatched, it feeds on the Spider or some insect which has been placed in its cell.

**Humble Bee.**—There are about forty different species of these wild Bees found in Britain, and the name of Humble, or Bumble, is derived from the “humming” or “bumming” sound. The Latin name *Bombus terrestris* indicates “the ground buzzer.” In the Autumn the Workers, the Drones, and the old Queen, who first laid the eggs, all perish, but a young Queen, who has burrowed deep into the ground and slept through the Winter in some sheltered place, wakes up when the warm weather comes, and commences to make a

small nest or cell, often in an old Field Mouse's nest. Some Bees go deep into the earth in dry banks, others make a nest among heaps of stone, gravel, or dry moss.

The Queen then flies to the fields and gathers a quantity of pollen, which she places in a little heap in the cells she has made, and then lays a few eggs upon it. In a few days these eggs hatch into tiny grubs, which live upon the pollen, and the careful mother keeps them well supplied with this food until they are fully grown. They then spin a bright yellow cocoon; within this they change into pupæ, and finally become perfect Bees, having passed through the same stages as the Honey Bee. These are the Worker Bees. The empty cells are now used for storing either honey or pollen, to be kept until it is required for use. The Queen never lays eggs in these cells again, but makes new ones of wax on some prominent part of the nest, deposits pollen and eggs in these, and seals them over.

After from 40 to 100 eggs have been laid and hatched (all Worker Bees), the Queen lays a few more eggs, some of which turn to Drones and others to Queens.

When a Drone flies out of the nest it never returns again, as it is able to suck honey from the flowers. The Queens do return, and work for the colony until the cold weather sets in, when all perish except the young Queens.

As Humble Bees have longer tongues than Hive Bees for sucking up the juices of flowers, they visit many flowers not visited by the ordinary Bees, and, in consequence, fertilise plants which other insects do not go near. One of these plants is the Red Clover. The Honey Bee prefers White Clover. All the three kinds of Humble Bees have stings.

Other names for the Humble Bee are Bumble Bee, Drone Bee, Hummel Bee, Carder Bee, Dumbledor (in Hampshire), Bumbee and Foggie Bee (in Scotland), Bumbler (in the North of England), and several more.

**Hive, or Honey, Bee.**—For the purpose of giving a detailed account of the remarkable story that is to be told of this most wonderful creature, I am able, through the courtesy of Messrs. E. J. Arnold and Sons, of Leeds, to give the following from Mr. Alfonzo Gardiner's leaflet on "Bee Life." I have also

largely drawn from the same source for the life-histories of the Wasp and the Humble Bee. Mr. Gardiner very wisely divides the fascinating story of the Hive, or Honey, Bee into a number of sections, and I cannot do better than set these out in the excellent systematic order in which he records, bit by bit, the wonderful life-history of this well-known, and yet little-known, insect.

In a colony of Bees there are generally three kinds of Bees in the Summer-time—(1) the *Queen Bee* (which is the female or mother Bee); (2) the *Working Bees* or *Workers*; and (3) the *Males* or *Drones*, which do not work. There is only one Queen Bee in a hive. The Workers may number from 15,000 to 20,000; usually the Drones number from 500 to 2,000.

*The Egg.*—The egg of the bee is about  $\frac{1}{14}$  inch long,  $\frac{1}{16}$  inch in diameter, and is somewhat of an oval cylinder shape, slightly curved.

All the eggs in the hive are laid by the Queen Bee in the wax cells, or "comb," prepared for them. The principal laying of eggs takes place in the Spring. The eggs for Working Bees are first laid in one set of cells, then the eggs for the Drones later on, and if the hive is very full, and the Bees decide to have another Queen, the Queen lays a third set of eggs in a third set of cells specially prepared for the purpose. When laid, the eggs are slightly sticky, and therefore adhere to the bottom of the cell. The Queen has the power of laying between 2,000 and 3,000 eggs a day for several weeks together. This daily laying is four times her own weight, and she may lay over a million and a half of eggs during her life of three or four years.

This enormous laying of eggs could not be done for one day nor continued if the Queen had to seek her own food and entirely digest it. The Working Bees feed the Queen with partially digested food made of honey and pollen. From the time the eggs are laid to the winged insect appearing is about sixteen days for a Queen, twenty-one days for a Worker, and twenty-four days for a Drone. The heat of the hive, which is from 60° to 80° F., hatches the eggs.

*The Larva, or Grub.*—As soon as the egg is laid, the *larva*

**begins** to form, and in three days' time a tiny white *worm* or *grub* comes out of the egg. This part of the Bee's life is often called the Caterpillar stage.

This grub is fed by the Nurse Bees (Workers) with Bee-bread made of pollen mixed with a little honey and water. The larva is of a white colour, slightly curved, and a little pointed at each end. The future segments or divisions of the thorax or abdomen can be noticed—fifteen in all. The jaws of the larva are constantly moving, probably to grind up the grains in its food. In about a week the Nurse Bees close the opening of the cell with a lid made of wax and pollen, leaving small holes in this cover for the admission of air, so that the grub may not be suffocated.

*The Cocoon.*—After the larva has grown to its full size, from five and a half or six days, and having had several moults, the Nurse Bees cease feeding it, and seal the cell as just explained. Under the larva's jaws is a little knob of flesh with a fine hole in the centre called a *spinneret* (the little spinning apparatus). Through this hole the creature sends out a sticky substance which is formed in its inside. This stiffens into threads like silk, and with these threads it spins its cocoon (from the French *cocoon*, from Latin *con'-cha*, a shell).

A Worker and a Drone larva each spin an entire cocoon within the wax cell in about thirty-six hours, but a Queen larva only takes twenty-four hours, and lines its cell with silk only at the smaller end, forming half a cocoon. The creature remains at rest in the cocoon about two days, and then changes again.

*The Nympha, Pupa, or Chrysalis* (*nym'-pha* or *nymph* Latin, from Greek *nym-phē* = a bride, a young woman; hence, an insect in its young stage. Latin *pu'-pa* = a girl, a doll; hence, an insect in its imperfect form, as a doll is only an imperfect representation of a girl. *Chrys'-a-lis*, from Greek *chry'-sos*, gold, from the yellow colour of many *chrys-al'-i-dēs*).—The important and wonderful changes which take place inside the cocoon bring the creature nearer the perfect insect in appearance. The head, with its eyes, the thorax and the abdomen, and the legs and wings folded up underneath, can each be plainly seen. Inside

the creature equally wonderful changes take place, and its breathing organs, feeding organs, and nervous system all become developed. The *breathing organs* are very curious. Ten of the segments of the abdomen have each two apertures or openings on opposite sides of the body, called *spiracles*, connected with air-tubes inside the body, and by means of these the creature breathes.

*The Imago, or Perfect Insect* (Latin *im-a'-go* = an image).—The creature bites round the cap of the cell which holds it captive, and forces its way out, being assisted by some of the Working Bees. It is now a weak, pale-coloured young Bee. Its hairy body soon dries, and it quickly begins to eat, and then commences its life-work, such as feeding the larvæ, cleaning the hive, closing up cracks, secreting wax, building cells, attending the Queen, collecting honey and water, etc. The Working Bees begin flying from the hive when they are about seven days old; when about fourteen days old, they begin to gather honey and pollen. The empty cells may be used many times for rearing other Bees, or they may be filled with honey; but if used over and over again for brood, the wax becomes very dark-coloured.

*The Queen Bee, or Mother*.—There is only one Queen Bee in a colony, and she is the only perfect female in the hive. She lays the eggs, and lives about five years. The Queen has a sting, which she rarely uses.

The egg which produces the Queen Bee is laid in a specially prepared cell, called a "Queen cell," and the grub is carefully fed by the Nurse Bees with a specially prepared food called "royal jelly," which they make from honey and pollen ground up in their mouths. This food, being mixed with the saliva of the nurse, is partly digested before being given to the grub.

The Queen selects one husband only from all the Drones. The first few thousand eggs she lays produce Workers; afterwards eggs for Drones are laid; and lastly, if the conditions of the colony are favourable (*i.e.*, if the hive is well stocked, and it is necessary for a "swarm" to leave it), a few Queens are reared.



The Queen comes to perfection from the egg in about sixteen days. If the hive is not full, any new Queens that have been reared are all stung to death in their cells by the old Queen. If the hive is very full, one of the new Queens is allowed to come out of the cell, and as soon as she appears, the old Queen leaves the hive, taking with her a part of the Bees, and goes off to form a new colony. This is called "swarming." The swarm collects in a mass on the branch of a tree, a bush, or some other place, and can be collected and placed in an empty hive. The Bees will generally set to work immediately to make wax and honey, just as they did in the old hive. If two Queen Bees come out of their cells together, they fight until one of them is killed. The Queen Bee never leaves the hive except on the day when she selects her husband (when she takes a long flight in the bright sunshine), and again in the swarming season.

The cells in which the different eggs are laid vary in size. Those for the Workers are the smallest, and those for the Drones are broader and longer. In the Spring-time, after the Drones appear, a cell for rearing Queens is formed. The Queen cells are usually made at the edges of the comb. They are of a large size and irregular shapes, and have their mouths turned downwards. After the Queens are hatched, these cells are broken up by the Workers, and the wax is used for making other cells.

*The Working Bees.*—These form the principal inhabitants of each hive. They do all the work, gathering in the honey and pollen, making the wax, building the comb or cells, feeding and taking care of the young. They are the smallest of the three kinds of Hive Bees, being only about two-thirds the size of the Queen, and, like her, have a sting. There is on the outside of the hind legs a smooth hollow, tipped with hairs, called the "basket," in which the pollen (which forms the food of the larvæ) is collected and carried to the hive. Working Bees live from one month to six weeks, but those born in the Autumn usually live on to the next Spring, though many die during the Winter if the weather is severe.

Bees are very strong, and can fly very fast for a long time

without alighting; their eyes are very powerful, so that they can see long distances. The three simple eyes on the top of the head help the Bee when it flies upwards; the compound eyes at the sides are for all-round and distant vision. When far from home and about to return, Bees fly high up into the air until they see their position, and then start towards the hive in as straight a line as possible, and with great speed. From this well-known fact, the shortest distance between any two places is often called a "Bee-line." The *buzzing* of the Bee is chiefly due to vibrations set up in the air by the rapid movement of the wings.

The body of a Worker Bee is dark brown in colour, about  $\frac{1}{2}$  inch long, with an outside covering of horny skin called *chi'-tin*, this skin being covered with hairs. At the end of the abdomen is the sting.

The sting of the Bee is a very curious apparatus. It consists of a long *sheath* to which are attached two *darts* with sharp points and edges like the teeth of a saw. Behind the dart is a *gland*, or bag, in which the poison is secreted. This poison passes through a tube into another larger bag called the *poison-bag*, where it is kept for use, and from this bag it flows through a little tube to the end of the sting. When a Bee stings, it first makes a little wound with the sheath, the poison passes down this sheath or tube, and the Bee then thrusts in the two little darts to deepen the wound. The saw-like edges of the darts make these very hard to pull out, and a Bee often leaves them behind, after which it quickly dies. The poison is so deadly that it will kill many insects, and both men and animals have frequently been killed when attacked by Bees in large numbers.

*The Drones, or Males.*—These are not so long as the Queen Bee, but are much thicker, and in their outward shape and appearance are somewhat like a large-sized House Fly, or a Blow Fly. The Drones only live from April to August, and their number in a hive varies very much. They do no work, but one of them is selected by the Queen as her husband. The Drones are usually killed off by the Workers about the time of swarming, or after the swarm has left the hive. The sting of

the Drone is only partially developed, and therefore Drones cannot sting.

*Wax Scales.*—Wax is made only by the Working Bees. At one time it was thought that Bees gathered the wax from plants, but it is now known for a certainty that the wax is made by the Bee out of the sweet juices of plants in the lower part of the abdomen. Here the wax forms little by little, and then passes out between the segments of the hind part of the abdomen in little scales, which the Bee herself (or assisted by some other Worker) takes off, and makes up into comb-work. The scales are at first very soft and oily, but as they reach the air they dry and thicken.

*Beeswax* is a most valuable substance. It is light in weight, and can be easily moulded and fastened in position by the Bees, and when made into cells can carry a great weight of brood (*i.e.*, eggs passing through their changes), honey, and propolis. It is also a slow conductor of heat, which is very important, for in Summer the cells do not get too hot, neither in Winter do their contents get chilled.

*Honey.*—The juice of flowers is gathered up by the *proboscis*, or *trunk*, of the Bee, which takes the place of a tongue, though it is not really a tongue. This flexible tube is made up of several parts, so that it can be lengthened, shortened, twisted, and bent in many ways, in order that it may gather up all the sweets found at the bottom of the flower-cups. If a flower is not full blown, the Bee will open it wide enough with its front legs so as to be able to get at the juices and the pollen inside the petals.

A great deal of honey is also gathered from the *honey-dew*, often found upon the leaves of trees, especially during warm weather. This substance is made by the *Aph-i-des*, or Plant Lice, which live on the juices of the leaves. Ants and many other insects, as well as Bees, greedily hunt for this luxury.

The juices gathered by the Bee are carried by the proboscis into the mouth; they then pass into the *honey-bag*, which is a kind of first stomach, where it is changed into honey. The sweet juices are not digested here, for Bees have a second

stomach for the digestion of food. The honey can be brought up from the first stomach to the mouth at will, either to feed the young, or to be stored up in the cells. As first gathered from the plant, the liquid juice is chiefly *cane-sugar*, but when the saliva of the Bee is added to it, a portion of it turns into *grape-sugar*. There are two chief kinds of sugar—*Cane* and *Grape*. They are each composed of *carbon*, *hydrogen*, and *oxygen*, but cane-sugar contains a little less hydrogen and oxygen, and is also sweeter than grape-sugar. Grape-sugar can easily be made from starch, sawdust, and cotton or linen rags. The grape-sugar changes somewhat, and crystallises in contact with the air; the other portion of the honey does not crystallise, hence the grained appearance of pure honey. The clear honey bought at the shops is rarely pure honey.

The liquid portions of the honey are water and a very slight quantity of mucilage. The taste and colour of honey vary considerably according to the plant from which it has been collected. Some of the best honey produced in the British Isles is made from the flower of the Heather. Lime-trees, Sainfoin, Mustard, etc., also produce very fine honey.

The honey is stored in the cells, either for food during Winter or for feeding the young Bees; and when the cells are full, the top of each one is sealed up with wax. For use during the Winter, an ordinary hive of Bees requires about 20 pounds of honey stored away in the combs.

When the blossoms of flowers are ready for fertilisation—that is, when they are just about full blown—the nectar (as the sweet juice found at the bottom of the flower-cups is called) is most abundant in them. The sweet fluid from which the Bees can make honey is occasionally found, in a few plants, in other parts than the flowers.

The flowers from which the Bees have obtained the honey can often be easily distinguished; *e.g.*, honey made from Clover is clear, with a light amber tinge and very fluid, whilst that obtained from Heather has a dark amber colour, and is thick and will not flow easily. The flavour also depends upon the source from which the nectar is obtained. Honey made from honey-dew is dark-coloured, often has an unpleasant taste, and

is sometimes poisonous. The honey obtained from Hy-met'-tus, in At'-ti-ca (Greece), and also from Hy'-bla (a mountain in Sicily), was, in old days, held in high repute, chiefly because the nectar was obtained from Wild Thyme and other fragrant herbs which grew in these parts.

The honey produced near Narbonne (in the South of France), and at Chamonix (just under Mont Blanc), as well as the Heather honey of Devonshire and Scotland, are all held in high estimation.

Occasionally honey possesses poisonous properties, especially that produced by the Brazilian Wasp, and the honey made round about Trebizond (on the Black Sea). Much of the honey sold in the shops is adulterated, and the clear honey in jars is often not honey at all, but is grape-sugar made from wheat-flour by means of sulphuric acid.

It has been calculated that a Bee requires to suck the nectar from a million flowers in order to make a pound of honey, and that 20 pounds of honey are required in order to enable them to secrete 1 pound of wax.

*Pol'-len* (from the Latin *pol'-len*, meaning fine flour). This is that fine, yellowish-looking dust, or powder, found inside the petals of many flowers; it is produced in the *an'-ther* of the flower, and when magnified it is found to consist of separate grains, each of a definite size and shape, every flower having its own particular form of grain. Pollen is the principal food of Bees during their larval life.

Pollen is a very important product of most flowers. The seed of a plant consists of two parts—(a) a live part or germ called an *embryo*, and (b) a *store of food* for the embryo to feed upon. The germ is the pollen, and the store of food is chiefly albumen.

Before the seed in a flower can properly form, the pollen must be carried to the albumen, which it reaches by a part of the flower called the *Pistil*, passing through the *Stig'-ma* and *Style* to the *O'-va-ry*. This is done in various ways, mostly by the wind or by insects. When the pollen is conveyed by wind, the flowers are, as a rule, scentless, honeyless, and of a dull colour; but when it is conveyed by insects, the flowers

invite the insects by sweet liquids, sweet perfumes, or fine colours.

Under favourable conditions of weather and sunshine, therefore, the germ grows and the seed or fruit forms; but if the weather is unfavourable for insects flying, or if there is a scarcity of insects, then no fruit appears upon those plants which require the pollen to be carried to them by insects.

The way in which Bees and other insects cause the pollen to be carried from flower to flower is by the hairs of their bodies becoming covered with it, so that the pollen from one flower is carried to another one, and some of it falls on the stigma of the pistil. Flowers which have stamens but not pistils are called Male Flowers; those which have pistils but not stamens are called Female Flowers; but many flowers have both pistils and stamens along with the petals.

The Workers in a hive of Bees may gather 14 pounds of pollen in a season; this they store up in the cells of the comb. It is carried to the hive in masses, collected on the back part of their third pair of legs. Each time a Bee goes out to collect pollen it only visits one species of flower. This is proved by the fact that the little masses brought back are always of the same kind of pollen. This cannot be noticed by the naked eye, but a microscope shows it very readily.

*Prop'-olis*.—This is a gummy kind of *Resin*, of a reddish colour, somewhat resembling wax in substance, but with a peculiar smell. It is collected by Bees from the leaf-buds of certain trees, such as the Poplar, the Birch, the Horse Chestnut, etc., and is used for fastening or strengthening their comb-work, for filling up holes and crevices in the hives, to prevent the entrance of cold air, water, or enemies. It is sometimes called Bee-glue. Propolis is soft and sticky in warm weather; in Winter it is hard and brittle.

*Ant*.—This little insect is one of the numerous enemies Bees have. Man, who collects the honey from the Bees, may be said to be its chief enemy; but Wasps, Hornets, Mice, Birds (especially the Bee-Bird), Frogs, Spiders, Ants, the Honey Moth, the Wax Moth, and the Cuckoo Bees, as they are called (whose foster-young starve the real Bees by consuming their

food), are all serious enemies. Ants, and many other insects, enter the hives, steal the honey, and eat the eggs.

**Solitary Bees.**—These Bees differ from those we have recently considered, not only on account of their solitary habits, but also by reason of their consisting of males and females only. Each female builds a home to shelter her own young one, but it should be stated that even these solitary insects sometimes form their burrows in close proximity to one another.

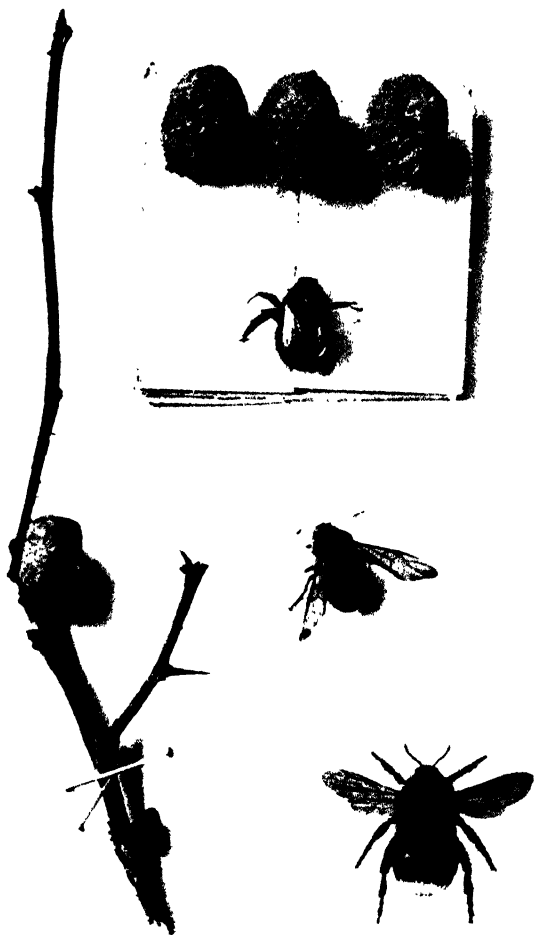
There are Cuckoo Bees, who are parasites, hence the fore part of the English name; and Leaf-Cutter Bees, who construct most remarkable nests composed of the leaves and petals of flowers, these being cut out by the Bees in little circular pieces.

Then there are in this country some small kinds of Carpenter Bees, which form their nests in bramble stems, and a very handsome solitary species, known as the Fulvous Bee, is deserving of mention.

This insect is very hairy, and reminds one of a Humble Bee, whilst some of the small Carpenter Bees are distinctly Wasp-like in general appearance.

Lastly, there is the industrious Mason Bee, with a short account of whose labours we may bring this section of our work to a conclusion.

We need go no further than the Mason Bee as an illustration of an insect's industrious habits. One can hardly credit that a small insect, such as a Bee, could of herself build such a wonderful nest. Here is a home made without hands. We may well wonder at the mossy cradle of the Chaffinch, or the globular homestead of the Long-Tailed Tit, sparkling with silver and gold lichen, but what praise must we bestow upon the Mason Bee—a mere insect—as a slight testimony to her perseverance and courage in constructing her little citadel! Did ever human labourers build a more secure or model household with bricks and mortar, cement or concrete? Never! How does she do it? I would have you watch her movements on your own account, but, shortly stated, earth is used by the Bee, and this she cleverly pounds into a kind of mortar. The earth is mixed with saliva, and made into a paste, and, with the materials all ready, the first cell is constructed. How is it



MASON BEE AND THREE NESTS AT TOP  
HUMBLE BEE  
CASE OF SAW-FLY AND INSECT THAT EMERGED FROM SAME, BELOW





done? Let the young insect student find this out on his own account. How do birds build their nests? We have had a few trustworthy and incomplete records, but, as with the Mason Bee, we never seem able to catch these interesting insect and bird folk in the very act of nest-building, and much remains to be accomplished. We see a nest started, and, time being of importance, we are not able to visit the site again for a day or two. When we return the structure is complete, but we are not satisfied: we want to know exactly how the owners went about their work. Be encouraged, then, and make a special study—if you are so minded—of the house-building of some of our commonest British animals.

To return to the Mason Bee. Having built one cell, she collects honey and pollen from the flowers. Mixing these together, she deposits same in the cell, for nothing is left to chance in Beeland. Then an egg is laid, and the cell is covered over with the mortar-like material. Further cells are constructed, and the same process carried out as just described, until eventually eight or nine cells are ready, each containing an egg. This accomplished, mortar and small stones are utilised wherewith to cover all the cells, and when finally completed the whole presents the appearance of an earthen billiard-ball. For what purpose, you may well ask, is the honey and pollen secreted in the cell? The Mason Bee is a wise and solicitous mother. She knows full well that, when the egg hatches, the young grub will require food. It finds it near at hand. Helpless in its babyhood, its mother's forethought provides it straight away with the necessities of life. Having eaten sufficient, the grub enters into the pupal state and that condition being satisfactorily passed through, it eventually comes forth as the perfect insect.

#### **Order V.—LEPIDOPTERA (OR BUTTERFLIES AND MOTHS)**

The life-cycle of a Butterfly or Moth is perhaps one of the most remarkable revolutions in the great wheel of animal life, and being, in many cases, comparatively easy to observe, cannot fail to attract a good deal of notice. At the commence-

ment of this chapter some notes were made concerning the young Lepidopterist, and these need not be repeated here. A good deal of general information about insects has also been afforded during our progress through the various Orders already considered, so that it is only necessary at this stage to set out briefly a few of the more important features of Butterfly and Moth life.

Both these belong to the great Order of insects called *Lepidoptera*. This latter comes from the Greek words *lepis*, a scale, and *pteron*, a wing. Being more literally translated, this means that lepidopterous insects are scale-winged, or have their wings covered with minute structures called scales. Only those who have examined the wing of a Butterfly or a Moth through a microscope have any idea of the structure of these scales, or of the wonderful manner in which they overlap one another.

Both Butterflies and Moths pass through three distinct stages before reaching the adult state, and, as will have been learned by this time, if the young reader has followed our story carefully, these stages are as under :

First, the egg (ovum, plural ova);

Second, the larva (plural larvæ).

Third, the pupa (plural pupæ).

The last stage of all is the perfect insect known as the imago (plural imagines).

As regards the second stage, *i.e.*, the *larva*, this Latin word means a ghost, a mask. Thus the larval stage of an insect hides, as in a mask, its future appearance. Few people excepting entomologists use the word larva, the one usually employed being Caterpillar, and Chrysalis instead of pupa. *Caterpillar*, it is interesting to notice, means "hairy cat," from the old French *chatapelouse*, from Latin *catulus*, a cat, and *pilosus*, hairy. The grub of a Bee is not hairy, but the larva of an insect which passes this stage in the open air is usually covered with hairs, as the caterpillar of many Butterflies and Moths. Caterpillars of all kinds are called in many European dialects by names which mean "cat."

It is only possible for the attention of the young lepidopterist to be directed towards some of the more interesting features of Butterfly and Moth life. These suggestions will, at any rate, be a basis upon which he can work, and suggest some things to him which might otherwise be overlooked. Thus the eggs vary in a most wonderful way. In some the shell is very plain, in others it is beautifully ribbed. The eggs are of various forms, and not only this, but they undergo many changes deserving of careful study after they are laid.

Then, again, the egg is laid in many different places; most of them are very minute and require careful searching after. The young entomologist must learn the favourite food plant of the larva to enable him to locate the eggs, and many points will crop up in this way of an interesting and instructive nature.

The larvæ vary in colour, form, shape, and duration. Many are very beautiful; some are commonplace unless examined through a glass. When thus seen, I always think, anything is worth looking at. Some live in the ground, or proceed there to pupate after they are hatched; others are entirely terrestrial, or arboreal. A common larva should be obtained and structurally examined. This experiment will be found more satisfactory than whole pages of descriptive matter. A good text-book, however, should be consulted, a remark that applies to each branch of Natural History with which we deal. Having procured a larva, an examination should be made of the hairy or spiny clothing (if present), the segments of which the body consists, the true legs and the false legs, the claspers, the head, the mouth, the warts, the breathing holes and tubes, the eyes, the antennæ, the spinneret, etc.

The mode of feeding; the environment; the protective coloration; the shedding of the old larval skin as the creature becomes too large for its covering; the first indications that the all-important pupating process is about to be performed, and then on to the final pupa, and later to the emergence of the perfect insect—all these points, and a great many more, will reveal a wealth of interest and wonder to the industrious young student of a truly amazing character.

Pupa in Latin means "a doll or puppet," and much atten-

tion must be paid to this stage of an insect's existence. Pupæ vary greatly in colour, size and shape; they are attached in various ways and in various positions. Some are provided with a beautiful silken girdle, and I was especially interested in watching some larvæ of the Swallow-Tail Butterfly not long since engaged at this most fascinating work.

The Silkworm Moth—of which we shall learn a good deal later on—encloses its pupa in a most wonderful silk cocoon of great commercial value, and a careful and intelligent study of the various forms, colours, and shapes of the pupæ of even our British Butterflies and Moths would be found a most attractive and engaging study.

Further, the watching of the pupa as it slowly but surely attains the time when the wonderful resurrection of the apparently dead and inanimate creature has arrived, is a most exciting time, and when eventually the pupa case splits asunder and the perfect insect emerges, almost the last stage in this wonderful cycle is reached. What makes the whole transformation—which every intelligent person must admit is one of the many great wonders of Nature—so vastly interesting is that it can be carried out at home by the discriminate, humane, and observant boy before his own eyes and right under his own observation. The eggs can be sought for and found; these can be placed in a suitable breeding “cage” and allowed to hatch. The larvæ will then require constant attention, for they are voracious feeders. The proper and natural food plant must, if possible, be procured. The creatures should be watched most carefully from day to day, and a systematic notebook kept of their habits, form, change, etc. The date should be jotted down when the eggs were found and where; when the eggs hatched; how long the larva lived as such; when it ceased to eat and commenced to pupate; how many times it changed its skin and when; when it finally pupated, and what it looked like; how long it remained a pupa, and any notes upon its general form and coloration; when signs were forthcoming that the perfect insect was about to emerge; when it did emerge, what happened, and what it looked like. These and a great many other points will occur, and eventually the zealous

young student will find it a most entertaining occupation to "set" his treasured specimens and then to place them systematically in his collection.

I do not for one moment decry the discriminate collecting of insects—and Butterflies and Moths in particular—but I do strongly object to indiscriminate collecting in any shape or form. For example, I once met a couple of well-educated boys catching Butterflies with their caps. In a box they had a number of beautiful insects (common, but nevertheless beautiful, bear in mind), battered almost beyond recognition, and one of the most handsome specimens of the Painted Lady I have ever seen, with a huge pin stuck through her abdomen. A few words of advice, firmly but kindly tendered, had, I believe, some good moral effect upon these young Butterfly hunters, and any indiscriminate collector who reads this book might also take heed of what I write.

There is much more to be said regarding Butterfly and Moth life, such as the magnificent colourings which many display; the remarkable head, with the wonderful globular eyes; *palp*, *antennæ*, and *proboscis*; the important divisions of the body; the structure of the legs and the wings; duration of life of the perfect insect; and many other features.

Further, the time of appearance of the various species, those that are diurnal and those that are nocturnal; those that are good strong flyers and those that possess a jerky, hesitating flight; the manner in which Butterfly and Moth life varies according to the soil, the situation, the conditions, or the flora, or a combination of them all—these and many other points occur to me as I write which might well engage, repay, and overpay the attention given them.

I have now endeavoured in a few pages to set out what might have occupied—were it possible—a very considerable portion of this whole volume; but it is my fervent hope that, however brief my notes are, they will be found sufficiently attractive to invite the young naturalist to devote attention to this branch of Natural History Study.

We may now consider the life-histories of a few of our commoner British Butterflies and Moths, but must of necessity

pass over a number of species which are undoubtedly deserving of attention, but which considerations of space preclude us from dealing with

### Butterflies

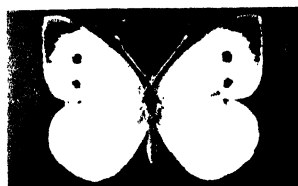
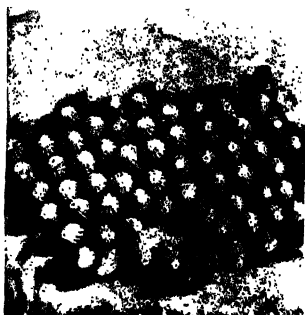
**Large Garden White.**—This species is commoner in some seasons than others. It is not so prevalent as the Small Garden White next upon our list, and may at once be distinguished by its larger size. The insect is white above, with black tips on the fore wings. The under surface is sulphur-yellow. The female has two black spots on the forewings and a dash of black. The male lacks these markings.

The egg is yellowish, and the shape of a cone. It is beautifully ribbed and veined, and, as with many eggs of Butterflies and Moths, can only be appreciated when seen through a glass. Cabbages are a favourite haunt for the female to choose whereon to lay her eggs, and the larvæ feed ravenously upon the leaves and often commit much havoc. The eggs are deposited in batches of from six to over one hundred. The bluish-green larva is streaked with yellow. The pupa is grey, spotted with black and streaked with yellow. It is found on walls, out-houses, fences, and similar places. This is one of the first Butterflies to be seen in the early Spring.

**Small Garden White.**—This smaller species has the fore wings only slightly tipped with black in the Spring brood. In the Summer brood, however, these tips become more pronounced. The male from the Spring brood has faint black spots; if from the Summer brood, he has one prominent spot of black, but the female has three.

The greenish egg eventually turns yellowish. The larva has a green body with a brownish head, the body being marked with black, and bearing small blackish hairs. There is a yellowish line along the back and a further spotted one of the same colour on the side.

This Butterfly, or rather its larva, is a great enemy of the cabbage grower, and quite riddles plants with its ravages. It also feeds upon Nasturtiums and Mignonette. The pupa varies in colour, and brown, grey, greenish, and other varieties, may be







EGG IN SITU



SIDE VIEW OF EGG



MALE READY FOR FLIGHT

found. It is marked with black—at times prominently, at others only faintly. It is to be found in similar places to that of the larger species already described. It should be stated that the larva of this insect is often visited by the Ichneumon Fly, the latter piercing the body of the larva and depositing her eggs within. An instance which recently came under my notice of this is mentioned in the life-history of the Ichneumon.

**Green-Veined White.**—This delicate Butterfly appears in May, and should be sought for in woods, lanes, and similar secluded spots. It might on first acquaintance be mistaken for the Small Garden White, but the beautiful green-veining is a distinguishing feature.

The female is more prominently marked with black spots than the male, but there are varieties which require careful examination.

The pale straw-coloured egg is laid on Hedge Garlic and similar plants. It changes to greenish as the larva matures within. This latter, when it appears, is green above and whitish-grey below. Its body has black warts, as well as blackish and whitish hairs. There is a dark line along the back and a yellow one on the sides. The pupa varies in colour, but is usually yellowish, green, and brown.

**Orange-Tip.**—The male of this beautiful little Butterfly has an orange patch on the whitish fore wings, the extreme tip being blackish. Instead of orange, the female has blackish-grey; she also has a more pronounced black spot on the fore wings. The coloration underneath is not alluring, but remarkably lovely, being mottled with greenish-grey. The favourite food plant is the Cuckoo Flower, and upon this the whitish eggs should be looked for in May and June. After they have been laid, the colour changes to yellow, then orange, and last dark violet. The dull bluish-green larva is clothed with whitish and blackish hairs. There is a white line along the side, and the upper surface is not so green as below. The pupa tapers towards each end, and is green at first, but becomes pale grey or whitish-brown, specked with brownish. Sometimes it remains green, and does not change. The wing veins may be distinctly seen.

**Brimstone.**—This beautiful Butterfly has been especially plentiful this Autumn (1908), and to my mind is one of the most beautiful common species we possess. The bright sulphur-yellow of the male and the lighter greenish-yellow of the female, although not alluring as the handsome Peacock, the Painted Lady, or the Red Admiral, are bound to attract notice. These Autumn specimens are more beautiful than those seen in the Spring, the former being freshly emerged, those seen earlier in the year having hibernated during the Winter. There is a central spot of orange on each wing; the veining is very distinct; the antennæ are reddish, and the thorax is clothed with long silky hair. A quantity of Buckthorn grows here (Letchworth, Herts), and this doubtless accounts for the prevalence of the Brimstone, this being the favourite food plant of this species. The greenish eggs are deposited on the leaves early in Summer, but they change to yellowish, and later to dull purplish-grey. The larva is green, with more bluish on the sides, and specks of black. There is a pale line on each side of the body. The bluish-green pupa is noticeable because of the humped thorax and other peculiarities of formation.

**Large Tortoiseshell.**—This species is brownish-orange, with black spots and blotches on the fore wings. Some specimens have also blue crescents on the hind marginal border. The colour underneath is brownish. It should be sought for near the woodland or in a country lane, and exhibits a strong liking for elm-trees.

The ribbed eggs are laid in clusters, and are well worth examination. The larva is black, with ochreous-grey upon the sides and brownish-black below. It has numerous spines, and a shining black bristly head. It feeds upon elm, poplar, willow, cherry, etc. The pupa is greyish, with a pink or reddish tinge, and a little greenish, brown, and black. The back bears spots of gold.

**Small Tortoiseshell.**—This is a commoner species than its larger relative, and, unlike it, lays its eggs in May and July upon Nettles. These are green in the first instance, but change to yellowish. The larva is the latter colour, profusely covered with black hairs. There is a black line along the middle of



Egg attached to leaf



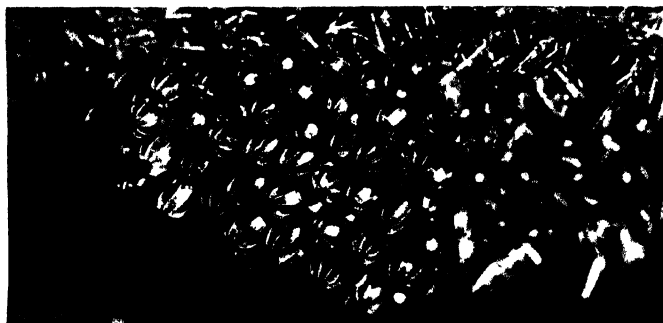
Eggs on buckhorn



Larva



Adult butterfly on leaf



BATCH OF EGGS ON NETTLE



LARVA



ADULT BUTTERFLY ASLEEP



PUPA



UPPER AND UNDER SIDES

THE LIFE HISTORY OF THE SMALL TORTOISESHELL BUTTERFLY

the back, and the spines also bear black tips. The black hairy head is speckled with yellow.

A number of these larvæ may be found together, they being social in disposition. They remain thus until they pupate. The pupa is greyish, and occasionally tinged with pinkish, whilst some have a metallic lustre.

The adult insect is reddish-orange, patched with yellow; the wings are spotted with black, and have blue crescents on the margins. The colour on the under wings is very unattractive, and by reason of this the protective coloration is very marked.

**Peacock.**—This beautifully-coloured and bold, strong-flying Butterfly should be sought for in early Autumn. It cannot fail to arrest attention because of its handsome colouring. The general colour above is rich velvety red and brown, but the chief distinguishing features are the "Peacock eyes" upon the fore and hind wings. These are somewhat like the markings on the tail of the Peacock, hence the popular name given to this insect. The underneath is dark brown and black, a very striking contrast to the rich coloration above. When the wings are suddenly opened, the eye of the observer is at once charmed by the beauty revealed. The Nettle is a favourite food plant, and there, during April or May, the olive-green eggs should be looked for. The velvety black larva is dotted with white, and the body is well clothed with spines and hairs. The pupa will be found to vary, being brownish-grey, greyish, pale brown, or greenish, with some black marking.

This, as has been noted, is a bold, strong-flying insect, very tenacious, and a lover of open country. Although usually seen late in the year, I remember observing a beautiful specimen in a garden (apparently just come from its hibernating quarters) at Easter, 1907. The insect alighted on a clump of Primroses, and the beautiful sight it presented as it spread out its wings upon the pale sulphur-yellow flowers will not be readily effaced from my memory.

**Red Admiral.**—This is another striking and very beautiful species. It is much commoner than the Peacock last described, and in the Autumn is a great frequenter of our gardens. It dearly loves to sip the nectar from the blossoms of the Sedum,

and, like the Humble Bee, often takes more than is good for it. So engaged have I found this Butterfly that I have on many occasions stroked it whilst feeding, the insect not being in the least perturbed. I am writing, too, of wild specimens in the garden.

The colour above is blackish-brown, with rich red bands on both the fore and hind wings, and white spots on the former. Along the outer margin of the fore wings there is a faint tinge of blue, and the same may be found at the angle of the hind wings. The scalloped margins of all the wings are white, with black points. The colour on the fore wings underneath is somewhat similar to the upper wings, but the hind wings below are plain brownish-grey. There is a good deal of variation in the colour and markings of the Red Admiral, however, which should be carefully noticed.

The eggs are green and ten-ribbed, and should be sought for upon the Nettle. When these are on the point of hatching, the colour changes to greenish-black. The larva is solitary, not social, as in the Peacock and Tortoiseshell Butterflies. It varies in colour, and three of the commoner types may be mentioned. One is greyish or grey, with yellowish-green markings; another is blackish, with white freckles and two yellow stripes on the sides; and a third variety is dark brownish, with pale spines on the back and black on the sides. The pupa is greyish, and is marked with gold on the centre of the back, and also on the head and thorax. It is generally attached to the under side of Nettle leaves.

**Dark Green Fritillary.**—The Fritillaries are a very beautiful Genus of Butterflies, and whilst the Silver-Washed Fritillary and two or three of its relatives frequent woods to a great extent, the Dark Green species and others will be found in more open country, such as moors, downs, large fields, and elsewhere. This species is reddish and brown in colour, well marked with black spots and lines; but the under side is brown, greenish, yellow, silver, black, and red.

The ribbed and cross-ribbed egg is yellowish when first laid, but soon changes to a darker colour. It tapers in shape towards the top. The larva is purplish-grey and black, and

has a hairy body. There is a stripe of yellow down the middle of the back, and similar marking on the lower sides, as well as a row of reddish spots. The black spines are branched. The head is the same colour. The larva should be sought for upon the Dog Violet. It feeds in May and June. The perfect insect appears in July and August. The pupa is glossy black and pale brownish.

**Pearl-Bordered Fritillary.**—There are a few other members of this Genus that might claim our attention, but the notice of the Pearl-Bordered must suffice. This species is, like the Silver-Washed, fond of woods and their vicinity. The Dog Violet is the food plant, and the whitish-green egg (afterwards brownish) should be found in May or June. The larva is hairy, and has a greyish-edged black line along the centre of the back, a greyish stripe on the sides, and a velvety black head. The brownish pupa has the raised parts of the head and thorax greyish; it is lighter brown on the body, and has blackish points.

The perfect insect is reddish-brown above, blotched and spotted with black, and dark at the bases of the wings. The silvery spots on the under sides of the hind wings are very pretty and decorative, but the general colour below is much lighter than on the upper surface.

**Grayling.**—This Butterfly, like the Fritillaries, the Meadow Brown, Small Heath, and some others, appears to be gregarious, numbers of them flying about together, and presenting a very attractive sight. One sunny morning recently I noticed at least thirty or forty Small and Large Heaths, Blues of various kinds, Brown Argus and Small Coppers, all flying about coquettishly together in a most sociable manner, and as they danced about in the sunlight it was very pretty to see them.

The Grayling seems to thrive upon the chalk in large open situations, especially on a hill-side which contains a wealth of wild flowers. It is yellow, brown, and black in colour, has two spots of black on the fore wings, and one black spot on the under wings. These spots frequently have white circles. The fore wings underneath are ochre-coloured with a tinge of orange,



and have two black spots. The hind wings below are greyish-brown and whitish. The egg is of a dull creamy tint, and is ribbed; it has a slight depression at the top. This is laid upon grasses, which also constitute the food plant of the larva.

I have noticed many times how wonderfully protected this species is in colour. When it rests—as it so often does—it closes its wings, and it is a very difficult matter at times to locate the creature again, although it may have been only a few paces away when it was observed to settle.

**Wall Butterfly.**—A good specimen of this Butterfly is a very handsome creature. When flying it seems to delight in settling upon a roadway to sun itself, and my experience teaches me that it is rather a difficult species to capture. It also resorts to walls and other sunny places, hence the forepart of its English name. In colour it is bright fulvous, with blackish-brown veining, as also on the margins, with transverse lines. There is one black spot on the fore wing, and this has a white centre, whilst there are four similar spots on the outside of the hind wing. Greyish-brown and yellow is the colour below, and there is a row of six spots on the hind wing, and one black spot on the fore wing.

The egg is pale green, finely ribbed, and spherical in shape. It darkens in colour soon after it is laid. The food plant is the same as that of the Grayling. The whitish-green larva is dotted with white; it has three whitish lines on the back, edged with dark green, and a line of white on the side, fringed with greyish hairs. The pupa is generally greenish, with yellow and white tints and spots. There are two broods during the year, the first occurring in May and June, and the second appearing in July and August.

**Meadow Brown.**—This is a very common species, and, as its name implies, it is very fond of meadows. Where it does occur there it is usually found in plenty, and appears to me very gregarious.

It varies a great deal in colour, but a general description only can be given. The male is more or less blackish-brown upon both the fore and hind wings, with one spot of black near

the tip of the fore wing. This black spot has a white centre, and is mostly surrounded with orange. The same colour is also present beneath the spot. The colour of the under wing is much lighter. There is a black spot and white centre on the tip of the fore wing. The female is not so dark as the male, and possesses more orange on the fore wings.

The egg is laid on grass. It is whitish-green in the first instance, but turns to brownish-yellow and purplish-brown. The larva is bright green, and has a dark line on the back and a white line on each side. There are short whitish hairs on its body, and the hairy head is darker than any of the other segments. The pupa is pale green, with brownish on the wing-covers and points of the body. There are spots of black on the thorax, and the old larval skin is fastened to the pupa.

**Gate-Keeper.**—Whilst the young Butterfly hunter might perhaps confuse this species with a variety of the female Meadow Brown, it should be observed that the Gate-Keeper is not so large nor so dark in colour. It has more orange, and the black spots usually have two white dots instead of one. Lanes which abound in tall grasses are a very favourite resort of this species.

**Ringlet.**—This is a sombre-looking Butterfly, for it is sooty-brown in colour, spotted once or twice with black. The male is often found devoid of these markings, and is almost as dark below as he is above, but the female is lighter and more greenish. Both sexes, however, have two or three black spots on the under side of the fore wings and five on the hind wings. These spots are white in the centre, and also encircled with the same colour. They exhibit, however, much variation. The yellowish-white eggs are laid among the roots of grasses, or near them, and soon turn to pale brown. The larva feeds upon grass, and is pale brown, with a dark line on the back and three broad stripes on each cheek. The pupa is ochreous and reddish-brown, marked with brown on the wing-covers.

**Small Heath.**—This very common little Butterfly is almost sure to be one of the first which the young entomologist will encounter. Grassy fields, meadows, waysides, and similar

places, are the favourite haunts, and as it possesses a rather pretty flickering flight, is sure to attract notice.

The colour is pale tawny, bordered with greyish-brown or brownish, the border in the male being the more prominent. There is a spot of black near the tip of the fore wing. Underneath the colour is darker, and the eye-spots are sometimes missing. The female is invariably lighter than the male, and generally larger in size.

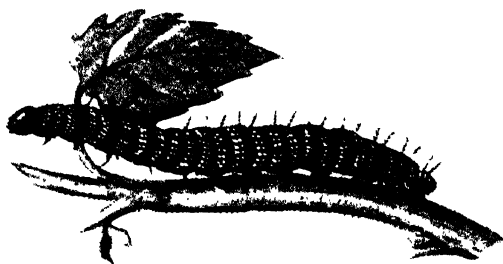
The green eggs change to whitish and brownish, and are laid on a grass-blade. The green larva is striped with a darker shade of the same colour, with pink towards the extremity of the body.

The pupa is yellowish-green, green, and brownish-red.

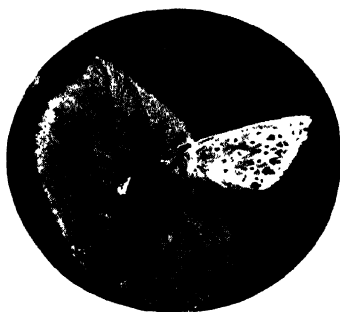
**Purple Hair-Streak.**—This Butterfly should be sought for in Oak woods, or the borders of same. Last July (1908) I spent a happy time watching this species in a Sussex Oak wood with great interest. The only fault I had to find with the insect was its tantalising habit of flying just over my head among the trees, so that it was with difficulty I could follow it, much less capture it. The latter, however, was not my object, for I am one of those individuals who, whilst acknowledging the legality of discriminate collecting, prefer watching the animate form of any creature. It was in the same woods and the same spot that I located the Dragon Fly—*Calopteryx virgo*—of which I have already told you, and as the males of both insects are dark-coloured, I was for the moment quite confused as to their identity. The Purple Hair-Streak is our commonest kind, and is the only one we can mention. The male is purplish-blue, veined with blackish; the fore wings are narrowly bordered with black, but the hind wings bear broad borders of the same colour.

The female has more bluish-purple and reddish on her upper parts, and is not nearly so uniform in colour as her handsome mate.

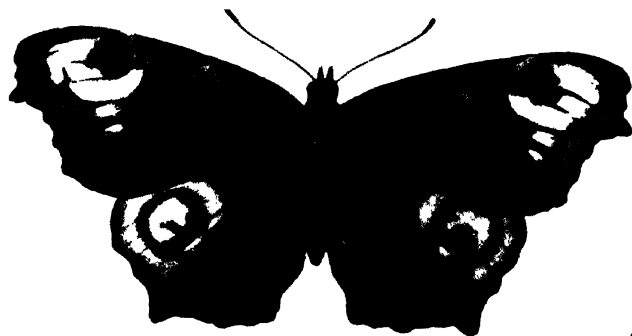
The under surface is greyish, with white lines, shaded blackish. On the hind wing there are three spots—one orange, one black, and the third orange with a black centre. The females I observed among the Oak-trees were evidently intent



LARVA OF PEACOCK



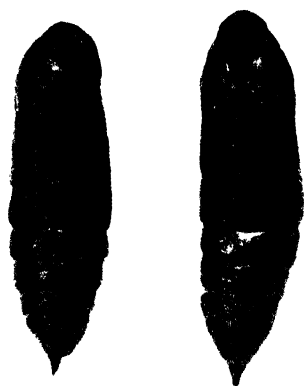
COMMON BLUE BUTTERFLY



PEACOCK BUTTERFLY



EGGS HIGHLY MAGNIFIED



PUPÆ



MALE MOTH ASLEEP

upon laying their eggs there, and caring naught for the disappointment caused to myself because I could not watch them comfortably. The egg is pale brown, tinged with pink and whitish. The reddish-brown larva has a line of black, with whitish edges down the back, whilst there are whitish stripes, edged with black, on each side of the central line.

The pupa is red-brown, freckled with a darker tint; the body, in a similar way to that of the larva, is downy.

**Small Copper.**—This is a very pretty little species, the bright copper-red on the fore wings and on the base of the under wings being very attractive as seen against the otherwise dark coloration. The fore wings are spotted and margined with black, while the hind wings have a notched band of black on the hind margin, with a copper band inside. This latter relieves very beautifully the otherwise dark hind wing. Underneath this insect is much lighter than above, the fore wings being yellowish-orange spotted with black, and the hind wings greyish-brown, with a number of small dark brown spots.

The Dock is the food plant, and the eggs are laid on various species of this plant. The egg is yellowish-white at first, but it eventually turns greyish.

The green larva is dotted with pinkish, whilst the pale whitish-brown pupa is marked with a darker colour.

The Small Copper is active in its habits, and is interesting in several ways. It appears upon the wing early and late, does not restrict its appearance to when the sun is shining and the conditions suitable for winged life to be astir are in evidence, and is easy to capture.

**Common Blue.**—Much care should be taken by the young lepidopterist as to identifying the various species of Blue Butterflies which we possess, and I write thus because just recently a friend of mine was under the impression that he had taken a number of specimens of the *Common Blue*, all from the same locality, but which, when we came to examine them carefully, were found to contain four different species. These are really exquisite little creatures, and it is a delightful experience to watch them pursuing their pilgrimage among the Wild Thyme, Trefoil, Rest-Harrow, and other plants, during

the Autumn. The four species obtained by my friend were all found upon the chalk, and this seems to me a very favourite soil for these Blues.

The male of the Common species is blue, tinged with purple; a narrow black line divides the blue from the fine fringe of white. The female is less alluring in colour, being dark sepia-brown, tinged with blue. She has a band of spots edged with red on both wings. The under surface is exceedingly pretty, the male being bluish-grey and the female brownish. There are a number of white-edged black spots on both the fore and hind wings.

The whitish-green egg is laid on the Bird's Foot Trefoil and Rest-Harrow.

The dark green larva has a black shiny head, while on the side of each segment of the body there are three pale, oblique, lateral lines. The pale green pupa has a dark green line along the back of the abdomen. The wing-cases have a brown tinge, and the head is pale brown.

The Chalk Hill Blue, the Brown Argus, and other Blues, are common on the chalk, and the young reader would do well to pay special attention to this Genus, many of which I am of opinion are frequently overlooked.

**Small Skipper.**—This little species reminds me that we have now reached the last of the commoner kinds of Butterflies upon our list, and we are cognisant of the scant justice we have done to the seventy odd British species. It is hoped, however, that what has been stated is sufficiently attractive to invite the reader to pursue the subject farther on his own account.

Closely related to the Blues, the Small Skipper is distinguished by its more inconspicuous colouring. It is rich orange-brown in ground colour, sprinkled with black scales at the base and hind margin of the fore wings and on the hind wings. There is a pale fringe, and just inside this a distinct black line. The colour below is greyish-brown, sprinkled with black scales. The white egg changes to a dull yellowish colour.

The larva feeds upon grasses. It is light green, with many fine black points on the fore part. The dorsal stripe is dark

green, and there is a strong line of pale green down the centre, and a still paler stripe on each side. The pupa somewhat resembles this coloration.

### Moths

Moths differ from Butterflies in being mostly nocturnal instead of diurnal in their habits. In their general life-histories, however, both Butterflies and Moths closely resemble one another, but there are structural and other differences which should be carefully noted. Mr. W. F. Kirby, in his admirable work "Butterflies and Moths of Europe," writes as under with regard to the habits of Lepidoptera—and Moths in particular—and I would direct the attention of the young entomologist to the above-mentioned book for an exhaustive account of the structure and habits of these vastly interesting insect folk. "Many Lepidoptera fly by day as long as the sun continues high. They do not appear much before the dew is dried off the grass, and generally go to rest at or before sunset. Among these are all the Butterflies, *Sesiida*, *Zyganida*, and *Psychida*, many *Bombyces* and *Geometra*, a few *Sphinges* and *Noctua*, and many *Micro-Lepidoptera*. They fly about in the sunshine with more or less activity, visiting flowers, or fulfilling the various functions of their lives; but in dull and rainy weather they fly little, hiding themselves in sheltered situations. The *Micro-Lepidoptera* are most active towards evening, extending their gambols into the twilight. Many *Sphinges* and *Noctua* appear at twilight, buzzing round flowers, but disappear again when it begins to grow darker. The greater part of the *Bombyces*, *Noctua*, and *Geometra* do not appear till twilight has given place to darkness. They fly till morning twilight, when they seek their hiding-places, and the twilight-loving species reappear for a short time. Many nocturnal species may be seen in the daytime, when disturbed from their resting-places; but they fly hastily and irregularly, and seek a fresh hiding-place as soon as they can. This is especially the case with *Geometra*, which are more easily disturbed by day than most other Moths, but hide themselves in hedges and bushes, or rest on tree-trunks. *Bombyces*, *Noctua*,



and occasionally *Sphinxes*, may also be found resting on tree-trunks, especially during the early part of the day. Their sleep is so profound, and they are so little susceptible to pain, that they may often be transfixed with a pin in this position without being roused. *Noctua* often hide themselves in dark corners in houses, especially in stables and outhouses, and many species—such as the Yellow Underwing, for example—are frequently met with hiding among long grass and the rank vegetation in weedy places; while many of the smaller *Noctua* may be found resting quietly on Thistles and similar flowers in the daytime."

If the reader wishes to obtain an adequate idea of the Moth-life of the district in which he resides, he will find it most entertaining to "sugar" or "treacle" at nightfall, and observe the different species who come to the feast prepared, and hold high revel there. The operation should be carried out throughout the Summer and Autumn, for as each week goes by some new species comes out, and in this way the work becomes most interesting, and at times positively exciting. Even if the young lepidopterist is not a collector no harm is done in feeding these sweet-tongued creatures, and, after examination, they can be liberated.

We have not been able, in our survey of either the Butterflies or Moths, to dilate upon the usefulness or otherwise of many of the commoner species. It should be stated, however, that some Moths are distinctly harmful, such as the Goat Moth, whose larva lives in the very heart of a tree, and frequently results in its downfall; the Yellow Underwing, which is one of the worst insect enemies the horticulturist has to contend with; and the Clothes Moths, whose larvæ have such a partiality for eating our clothing.

Whilst we have not a large number of species of Butterflies in this country, they are easily outnumbered by the Moths, of which over 2,000 different kinds have been recorded. Many of these are extremely small, and are known as Micro-Lepidoptera. Of these it is not possible for us to write on the present occasion. Others, such as the Hawk Moths, the Red Underwing, the Tiger, etc., are of large dimensions and hand-

some coloration, and it is to these and a few other common kinds that attention will chiefly be given. Over 400 species, it is stated, lay their eggs or feed upon Oak-trees alone!

It is interesting to notice before we pass on that Moths, unlike Butterflies, have spindle-shaped, thread-like, or comb-like antennæ. As a rule, Butterflies have knobbed, or club-shaped, antennæ (I am writing of British species, for foreign Moths cannot be so sharply divided as this); they are mostly, as Mr. Kirby has so well told us, day, and not night, flyers. The wings of Butterflies have no connecting hook, and are usually held in a vertical position when at rest, whilst the wings of Moths generally have a connecting hook, and are held flat when the insect is resting.

Moths are divided into a number of different groups, which the young student would do well to become acquainted with. The first group on the British list is the *Sphinges*, or Hawk Moths. In these handsome creatures the larva is naked, and bears a prominent horn at the extremity of the body. The perfect insects have the habit of poising in the air; hence the name Hawk Moth. The fore wings are long and pointed, and the hind ones small. The antennæ are usually fusiform, and often have a fine hair or hook on the tip.

Passing over the Death's Head Moth, which is characterised by the curious marking on the thorax being likened to a human skull and crossbones, and the *Convolvulus* Hawk Moth, neither of which is likely to come under the notice of any save the expert collector, brings us to a much commoner species—namely, the Privet Hawk.

**Privet Hawk Moth.**—As its name implies, the larva of this handsome Moth feeds for the most part upon Privet, but not exclusively, as I have recently found it feeding upon Thistles. It should be sought for in August and September, and will be much admired because of its splendid markings. It is green, with oblique stripes of white and lilac upon the sides, and the characteristic horn upon the twelfth segment. It is a voracious feeder, and I have known one specimen to devour twenty or thirty Privet leaves in one night.

Mr. Kirby writes of the larva of this species that "its

attitude in repose has been compared to that of the Egyptian Sphinx, and hence this name was first applied to the larva, then to the Moth, and subsequently to the whole group of which it forms the type."

The adult insect expands from  $3\frac{1}{2}$  to  $4\frac{1}{2}$  inches. It is brown on the fore wings, paler towards the costa and hind margin. The pale pink hind wings have three black transverse bands, and the abdomen is banded with black and rose. The pupa is dark brown, and has two short projections behind.

**Elephant Hawk Moth.**—This beautiful little Hawk Moth has the fore wings olive-green, with the costa, hind margin, and two oblique bands, rosy; hind wings rosy, with the base black; olive-green body, striped with rosy, the abdomen having a black spot on each side at the base. It expands about  $2\frac{1}{2}$  inches. The larva is brown or green, streaked with a darker colour; there is a pale streak on the sides of the front segments, as well as round black eye-spots on the fourth, fifth, and sixth segments. These spots have on the fifth and sixth segments a brown lunule, with a white border. The short horn is broad and curved. The larva feeds upon Bedstraw, Willow Herb, Fuchsia, Vine, etc., and should be sought for from July to September.

**Small Elephant Hawk Moth.**—This species, as its name indicates, is smaller than the last-mentioned, but is somewhat similarly coloured. An examination, however, will reveal that the present species is yellowish on the fore wings, has rosy spots on the costa, and the hind margin is broadly rosy. The hind wings are black on the costa, and rosy on the hind margin, with a broad streak of yellowish in the centre. The body is rosy. The larva may be found on Bedstraw in July and August. It closely resembles its larger relative, but does not possess a horn.

**Poplar Hawk Moth.**—This is one of the commonest Hawk Moths, but is not possessed of such rich coloration as those we have recently considered. It is brownish, purplish, or yellowish-grey, with a large reddish patch at the base of the hind wings, and one or two dark lines beyond it. It expands from  $2\frac{1}{2}$  to  $3\frac{1}{4}$  inches. The larva is greenish-yellow, with

seven oblique stripes of a lighter colour, and frequently with brownish-red spots on the side. The horn is short and straight and green in colour. Besides the Poplar, the larva feeds upon the Willow and other trees.

**Eyed-Hawk Moth.**—This very beautiful Moth is so called because of the prominent "eye-spots" on the hind wings. The fore wings are brown, clouded with a darker tint in the middle, and on the hind margins with two transverse dark lines. In the outermost of these is a dark spot. The hind wings are rose colour, and the "eye-spot" is black, with a blue ring in the centre. The insect expands from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches. The bluish-green larva has a white longitudinal streak on the first segments, and then broad, oblique white streaks. Sometimes there are reddish-brown spots on the sides. The horn is blue, and also the head. The food plant is Apple, Willow, etc.

**Humming Bird Hawk Moth.**—The young naturalist who keeps his eyes open has perhaps seen an insect flying in the garden, then suddenly hovering in the air, and then making a dart at some flower. He was probably so surprised at the unexpected event that he really permitted the insect to escape before he had realised exactly what it was like. This, at any rate, was my first experience with the Humming Bird Hawk Moth. So similar are the American species of this Moth that it is stated they cannot be distinguished from Humming Birds when upon the wing.

The adult insect is dark brown on the fore wings, with two black transverse lines. There is a black spot near the costa between the lines, and a further one towards the tip. The tawny hind wings have the base and hind margin brown. The abdomen is spotted on the sides with black and white. This is a day flyer as well as at night, and I have observed it in the garden in the heat of the day, pursuing its curious pilgrimage among the flowers. The green or reddish-brown larva has a longitudinal white stripe, and a yellowish stripe under the spiracles. The food plant is the Bedstraw, and the larva may be found in June and again in Autumn.

**Hornet Clearwing.**—This is a representative of a Genus of Moths which resemble Hornets. They appear from May to

July, and the larva feeds for two years before entering the pupa state. It is whitish-yellow, with a darker line on the back, and a blackish head. It will be found in the roots and lower parts of the trunks of Poplars. The Moth is very beautifully coloured, and might be easily mistaken for a Hornet by the inexperienced insect hunter. It is dark brown, with yellow on the palpi; it has two spots on the front of the thorax and the base of the two first and three last segments of the abdomen. The wings are transparent; the nervures and the costa of the fore wings are rust colour, and the hind margins are darker. The adult insect rests during the daytime upon the trunks of Poplars, especially near the roots.

Another common Clearwing, which is smaller than the last-named, and known as *Trochilium crabroniforme*, is uniform dark brown on the thorax, with a yellow collar. The larva resides in the stems of the Willow.

A large number of species of Moths are included in the Genus *Sesia*, or Clearwings, which belong to the same family as the Hornet Clearwings just described. The Currant Clearwing is, perhaps, the commonest species of them all. Attention should be paid to these most interesting insects, more especially as they very closely resemble one another, and it is often difficult to distinguish them. There are so many of these, and they require describing so minutely, that it is not possible for us to consider them here, and we must, therefore, pass on to the next Genus—namely, the *Zygana*, of which I have chosen the Six-Spot Burnet Moth as a worthy example.

**Six-Spot Burnet.**—This is a very richly-coloured little Moth, and seems a great favourite among young collectors. The fore wings are blackish-blue or green in colour, and are thickly scaled. There are six crimson spots on the fore wings, whilst the crimson hind wings have a narrow black border. The under side of the fore wings is slightly suffused with pale reddish-yellow. Varieties occur both in England and abroad, but this description may be taken as generally correct.

This Moth inhabits meadows and banks where there is a profusion of wild flowers, and similar places. The golden-yellow larva has two rows of black spots on the back, and

a row of smaller ones upon each side. The food plant is Clover and other dwarf kinds.

There are a large number of these Burnet Moths, which, like the Clearwings already indicated, appear somewhat similar, and a careful study of them is necessary, so that they may be correctly identified.

**Cinnabar Moth.**—This attractive species is black on the fore wings, with a blood-red stripe below the costa, and a shorter one along the inner margin, and two spots on the hind margin. The hind wings are blood-red. This is a day flyer, and resorts to weedy situations. It should be sought for in May and June, and the bright-coloured larva may be found in numbers on the Ragwort in July and August. This larva is black, with broad orange-yellow rings.

**Tiger Moth.**—This handsome species belongs to the *Arctia* Genus. It has a stout body, a soft proboscis, and the larva is very hairy, and is known as the "Woolly Bear." The perfect Moth expands from 2 to 3 inches. The fore wings are brown, with white interlacing bands crossing each other before the hind margin. The hind wings and abdomen are scarlet, with large bluish-black spots. The head is soft and velvety. The larva is black, and is armed with long hair and white warts. The hair is rust-coloured on the front segments of the body and upon the sides; on the other parts it is black, with white tips. It should be sought after in Spring and early Summer, and again in the Autumn. Whilst many kinds of insectivorous birds dearly love various larvæ, the hairy "Woolly Bear" does not appear to commend itself to them. The Cuckoo, however, is an exception, this bird being especially fond of the larva of this beautiful species.

**Buff Ermine Moth.**—This is a common Moth, and is bound to come under the notice of the young lepidopterist. It is pale ochre-yellow in colour, with small black spots, partly arranged in transverse rows; abdomen brighter yellow. It expands from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The brownish-yellow larva has a pale line on the back and a stripe of white upon the sides.

**White Ermine Moth.**—This is another common species. The fore wings are white, dotted with black; hind wings same

colour, but spotted with black in the centre and before the hind margin; abdomen ochre-yellow above. The larva is dark brown, with a prominent yellow line on the back, and black hairs.

**Vapourer Moth.**—This is an abundant species, and, beyond this, is specially worthy of inclusion here because the yellowish-grey female only possesses rudimentary wings. The fore wings of the male are brownish-rusty, with dark transverse lines; there is a round white spot near the hinder angle, and the fringes are spotted with a darker colour; the hind wings are rust-coloured.

The larva is ash-coloured, with reddish-yellow and white stripes. It will be found feeding on many kinds of trees, including the Laurel. The adult insect is very partial to woods and similar places.

**Pale Tussock Moth.**—This insect has the fore wings pale grey, dusted with a darker shade, and with three dark grey transverse stripes, the first and third of which are slightly dentated, the second being quite straight. The fringes are spotted with dusky; the hind wings are pale grey, with a suffused dark stripe before the hind margin.

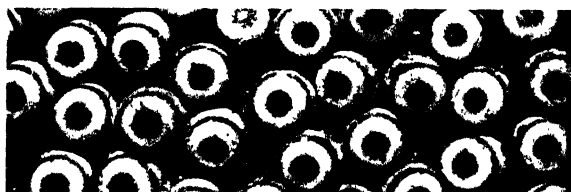
The greenish-yellow larva has black incisions, yellow tufts, and a long tuft of rose colour before the extremity. It should be found in September and October feeding on various trees and plants.

**White Satin Moth.**—This very delicate and beautiful Moth is shining white, with the antennæ, tibizæ, and tarsi alone black, the latter having rings of white. It expands about 2 inches, and is found upon trunks of Poplars in June and July. The larva is black, and in place of tufts of hair it has hairy warts. The sides of the body are yellowish, and there is a row of whitish spots on the back. The food plant is the Poplar or Willow, and upon these trees the larva should be sought in May and June.

**Black Arches.**—A common and destructive species, Black Arches appears in July and August. It is white on the fore wings, with prominently dentated black transverse lines; the fringes and thorax are spotted with black; the reddish



♂ AND ♀.



EGGS, HIGHLY MAGNIFIED.



LARVA.



♂ (above) and ♀ (below).



*PLATE LXXVIII*



LARVA OF GOAT MOTII



LARVA OF OAK EGGAR MOTII



LARVA OF LACEY MOTII

abdomen of the female bears upon the end a strong ovipositor. The brownish-grey hind wings become whiter towards the hind margin; the white fringes have black spots. The brownish-green, grey, or black larva has red and blue warts, and there is a spot of black upon the second segment, with a blue border behind and whitish upon the sides.

**Gold-Tail Moth.**—This Moth is white, with a black spot near the hinder angle of the fore wings. The end of the abdomen is yellow; hence the English name of Gold-Tail.

The larva is very attractive, having a double red line on the brownish back, and an interrupted white line beneath. There is a red line also on the sides, and white hairy warts on segments 5, 6, and 12.

**Goat Moth.**—The fore wings of this destructive species are varied with greyish-brown and pale grey, with many black, wavy, transverse lines running into one another, of which three or four are thicker and more sharply defined; the brownish-grey hind wings have the hind margin slightly suffused, while the vertex and collar are greyish-yellow. It is a large Moth, expanding from 3 to 4 inches. The larva (which smells most abominably) is dull flesh-colour, with a dark red back. It lives in the very heart of trees, and is especially partial to Poplars and Willows.

**Wood Leopard Moth.**—This is an attractive-looking Moth, the white having many small white or oval steel-blue spots on the wings and thorax; the abdomen is dark steel-blue. The spots on the hind wings are much fainter than those on the fore wings. The cylindrical larva is yellow in colour, with black warts, head, thoracic shield, and anal fold. It resides in the trunks and branches of Ash, fruit-trees, etc.

**Emperor Moth.**—We must of necessity pass by a number of smaller Moths and a good many more who do not possess an English name. This brings us to the Emperor. This is a fairly large Moth, expanding from  $2\frac{1}{4}$  to  $2\frac{3}{4}$  inches. It is reddish-brown on the fore wings, and rusty-yellow on the hind wings. The female is unlike the male, and has all her wings grey.

On each wing of the two sexes there is a black central eye,

containing a white crescent. The green larva has black transverse bands, with reddish tubercles, studded with short hair, and it should be looked for on Beech, Sloe, and other plants and trees in July and August. The pupa is enclosed in a cocoon covered with silk, and that of the female is much larger than that of the male, the female being larger than her mate.

**Silkworm Moth.**—This is a very important insect commercially, and is deserving of more than ordinary notice. This being so, I have pleasure in quoting the following excellent sketch by Mr. Alfonzo Gardiner. This sketch not only affords useful and interesting information concerning the Silkworm Moth, but will also enable the young naturalist to learn a good deal of the general life-history of the creatures whose biographies we have recently been considering. Mr. Gardiner writes:

“There are a number of species of Silkworms which feed on the leaves of trees, but the principal and most useful of these is the *Bombyx mori*, or the Common Silkworm, which feeds on the leaves of the White Mulberry-tree, and is domesticated in China, Japan, Bokhara, Afghanistan, Cashmere, Persia, South Russia, Turkey, Egypt, Algeria, Italy, France, and Spain.

“In all these countries the *Bombyx mori* lays its eggs but once in the year, and the caterpillar spins a larger cocoon than is spun by any other Silkworm Moth. The silk is also considered to be the best produced, and is generally of a golden-yellow or cream-white colour. This Moth is thought to have first come from the northern parts of China, where it is indigenous.

“There are a number of other Silkworm Moths cultivated in various parts of India, some of which produce several broods in a year. The silk from the cocoons of these is not nearly so good as that from the *Bombyx mori*, but is still very largely exported. In addition, there are in all parts of India a very large number of Wild Silkworm Moths, the cocoons of which are gathered and the silk wound off, as in the case of the domesticated ones.

"In Italy and France the *Bombyx mori* is cultivated under Government care, and forms a most important article of commerce; but both the Moths and the caterpillars are subject to many diseases, which kill the Moth before it has laid its eggs, or the caterpillar before it spins its cocoon.

"In early Spring the female lays her eggs, which are about as large as Mustard seeds (or as small pins' heads), and generally dies very soon after. The male Moth does not survive her very long. These eggs are very numerous, and are laid singly, varying in number from 200 to 400, or even more.

"They are fastened to the leaves of the Mulberry-tree, on which they are laid, by a sticky gum, and when first laid they are a pale straw colour. If they are unfertile eggs—that is, eggs which will not produce little caterpillars—they remain this colour; but if they are fertile, they begin to deepen in colour in a few days, becoming first brown, then grey, and lastly slaty-grey or greenish, according to the breed. Each egg also becomes depressed somewhat in the centre.

"If the eggs are kept in a cool place and free from damp, they will not hatch out. For breeding, the eggs are laid in the Spring of one year, and kept during the Summer and succeeding Winter, until the next Spring; but otherwise the eggs hatch out the same year, if they are kept in a warm place. Their colour becomes gradually lighter day by day. The body of the little caterpillar may be noticed with a magnifying-glass as it lies coiled up in the inside of the egg, a black spot showing where its head is. Finally, in the warm, bright days of Summer, the little creature bites a hole in the edge of the egg and creeps out.

"When first hatched the larvæ or young caterpillars are almost black, and are only about  $\frac{1}{8}$  inch long. They rapidly increase in size, feeding greedily upon the Mulberry leaves. In England they are often fed on Lettuce, but the silk from Lettuce-fed caterpillars is of poor quality. When full grown they are about 3 inches long, and their colour has changed to a yellowish-grey.

"Unlike many caterpillars, the body does not become

covered with hairs, but the skin remains smooth, and if examined with a glass it will be seen that, exclusive of the muzzle or snout, the body is built up of twelve segments.

"The Silkworm lives in its caterpillar state from six to eight weeks, during which period it moults or changes its skin four times, and with each change it grows in size and in greediness. It is now of a light ashen-grey or cream colour, with a hump on the last segment but one before the head. The head segment is large compared with the other segments. On the upper part of the last joint of the body is a kind of horn or short erect tail.

"Attached to the segments of the body immediately behind the head are three pairs of what look like hooks; these are the legs. Further back there are five pairs of 'claspers,' the first pair being situated on the last segment, and the others on the fourth, fifth, sixth, and seventh segments respectively. It is by means of these 'claspers' that the caterpillar attaches itself to the leaf upon which it feeds.

"Before each of the four changes of skin the caterpillar becomes somewhat sleepy and ceases to eat. When the skin is ready to be cast off it bursts in the forepart, and then by continually wriggling its body the caterpillar thrusts the skin backwards from it, and thus gets free. Very frequently it dies during one or other of the changes of skin. While the new skin is still soft the caterpillar increases very rapidly in size.

"About five weeks after the caterpillar has issued from the egg it stops eating, and crawls about, moving its head round and round, looking for a good place to spin its cocoon. This cocoon is made of silk threads, formed from a material in its own body. Inside the little creature are two small *glands*, or *bags*, filled with a kind of *gum*. These extend along a great part of the body, and end in two little *tubes*, or pipes, which join together in the under lip of the creature, and form a single tube. Through this tube the gum is forced out as a fine silk filament or thread.

"When about to spin its cocoon these glands grow very large, the worm ceases to eat, and first produces a number of loose rough threads, which form the outer part of the cocoon.

Each thread of silk as it comes from the body of the worm consists of two strands. After having spun a few of the coarser threads to hang itself by, the caterpillar folds itself up into a horseshoe shape, with its legs outwards, and then spins silk all over its body by moving its head round and round from one point to another.

"The outside silk of the cocoon is called *Floss Silk*. The finest silk is stuck together with gum, and the thread of which it is all made is in one piece, often about 1,000 feet long. Cocoons vary in size, but are usually about as large as a Pigeon's egg. About five days are occupied by the caterpillar in spinning the cocoon, after which two or three weeks elapse before the cocoon bursts and the perfect Moth comes forth.

"After about the fourth day, when the caterpillar has spun out all its silk, the worm inside the cocoon becomes of a waxy white colour. In time the skin wrinkles and comes off, being pushed away down towards the hinder parts, and the larva inside enters on its second stage of life, and becomes the *pupa*, or *chrysalis*. It now changes its colour from a waxy-white to a dark red.

"In its second, or pupa, state the Silkworm lives from two to three weeks, during which time a thin skin is formed over it, and the pupa gradually changes into a winged insect. When quite ready to leave its prison, it breaks the inside skin which surrounds it, wets one end of the cocoon with a liquid from its mouth, which soaks from the inside to the outside through the whole thickness of the silk threads, and separates, but does not break them. Through the passage thus formed the Moth gradually works its way. It is then damp and miserable-looking, but soon dries itself and becomes a perfect Moth.

"As the opening of the end of the cocoon by the Moth to allow it to escape somewhat spoils the cocoon, by preventing the silk thread being wound off in a perfectly even and unbroken thread, the Silkworm rearer prevents this, either by throwing the cocoons into hot water just when the insect is ready to burst through, or by placing them in an oven heated by hot air or by steam.

"The cocoons containing female Moths are somewhat larger

than those containing male Moths, and those cocoons which the silk-breeder wishes to keep for the purpose of rearing Moths for his next supply of eggs he selects with great care, so as to have about an equal number of male and female insects.

“The cocoons intended for breeding purposes are placed on a cloth in a rather dark room, which is kept at a moderate temperature, and when the Moths burst through the cocoons they do not attempt to fly away, but lay their eggs and die there. The caterpillars do not attempt to creep away (as the caterpillars of so many other kinds of Moths do), but remain feeding on the leaves with which they are supplied; and when the proper time comes they simply move about seeking a place where they can make their cocoon. When this time arrives, small bundles of twigs are placed above the feeding-place for the caterpillars to attach themselves to for cocoon-making.

“After the Moth has crept out of the cocoon, its wings expand and dry in a short time, and it enters into its perfect state. It lives only a few days, and takes little or no food. The body is thick and hairy, and the antennæ pectinated—that is, with fine teeth-like hairs down both sides, something like a comb. The perfect Moth is about an inch in length, the female rather larger than the male. The wings meet, the fore wing overlapping the hind wing, something like the slates on a roof. The colour is pale buff, with very often a pale brown bar across the upper wings.

“There are several varieties of Mulberries, and Silkworms are found on the leaves of all of them, but the leaf of the White Mulberry is the one which causes the caterpillars to spin the best cocoon. All the Mulberry-trees are natives of warm climates, and they shed their leaves in the Autumn. The Common Mulberry, or Black Mulberry, as it is often called, is a native of the middle parts of Asia. It was introduced into the South of Europe above 1,000 years since, and is now naturalised there. It is cultivated in the South of England, where it succeeds very well. The fruit, which is of a purple-black colour, with a dark red juice and slightly acid taste, is something like a Blackberry or a Raspberry in shape. Excellent

jam and wine are often made from it. The wood is not of much use, as it is very soft; and though Silkworms will feed on the leaves, the silk they produce is only of poor quality.

"The White Mulberry is a native of China, and is the best food for Silkworms. It is therefore cultivated in all countries where Silkworms are reared. It bears a yellowish-white fruit, which is also good to eat, but not nearly so good as the fruit of the Black Mulberry. There are several other kinds of Mulberry-trees, but these are the only two that are grown for Silkworm rearing.

"In China, Japan, and the Pacific Islands, the Paper Mulberry grows wild, and from the bark of the young shoots the Chinese and Japanese make paper. The thin, silky paper which is sometimes packed along with tea is made from this tree. The South Sea Islanders make a kind of cloth from the bark by beating it into thin sheets with mallets; it looks very much like unbleached cotton.

"When the caterpillar has completed making the cocoon (which fact is known by an entire absence of sound inside), the cocoons are carefully sorted into qualities, which the silk-breeder very easily tells by their outward appearance.

"In France these sorted cocoons are placed in a slightly-heated oven, which kills the chrysalis inside. In other countries the cocoons are placed in hot water, which has exactly the same effect. The cocoons are then prepared for winding off the silk by first removing the coarser outside threads. They are then placed in basins of water kept warm by charcoal fires underneath, or, in large silk-winding establishments, by means of steam. The water softens the natural gum which coats the silk, and thus loosens the various coils of silk which have been wound round and round to form the cocoon. The silk-winder then takes a small brush made of twigs and stirs it about in the water. This catches the outside portion of the cocoon, and in that way the ends of several threads are drawn to the surface of the water. From three to five of these ends are taken and placed together, uniting them into one thread, which is passed on to a large wheel, called the 'Reeling Machine.' This *reeling*



requires very great care, because the threads are very apt to break. As often as a thread breaks or a cocoon runs out—that is, when all the silk has been wound off it—another thread is joined on. A good cocoon will yield several hundred yards of good thread.

“This Raw Silk is now made up into *hanks*, or *skeins*, of various sizes. Formerly all the raw silk used to be made up into twisted threads, termed ‘Thrown Silk,’ but now a great deal of silk is woven in the raw state, and afterwards dyed in the piece. Raw silk is often used for the warp of the material, and spun silk for the weft of the cheaper kinds of silk, such as foulards and some satins. There are many other processes in connection with the manufacture of silk into threads, either for weaving or for sewing purposes.

“Before winding the cocoons, the flossy outside portion is removed, and after all the thread has been wound off there is another portion, very hard and compact, still remaining. Formerly all this waste silk was made little use of, but Mr Samuel Cunliffe-Lister (afterwards Lord Masham), of Manningham Mills, Bradford, discovered a successful method of utilising it. This has been one of the most valuable inventions in connection with silk, and a great trade has resulted in the manufacture of yarns (that is, silk threads for weaving, etc.) in Yorkshire, and also in France and Switzerland. On an average, about 100 pounds of cocoon are raised from an ounce of eggs, and from 12 to 14 pounds of cocoon yield a pound of raw silk.”

**Drinker Moth.**—This is a common Moth, and is sure to come under the notice of the young lepidopterist, because the larva is very easy to rear. This may be found feeding on grasses from Autumn until early the next Summer. It is dark brown, with a yellow stripe, broken into spots, on the sides. There is a black tuft of hair on the back of the third segment, and another on the last but one. The adult Moth has ochre-yellow wings, suffused with purplish-brown in the male, with two white spots before the middle. There is also a brown line which runs from the tip to the inner margin. This species expands from 2 to 2½ inches.

**Oak Eggar Moth.**—This Moth expands from  $2\frac{1}{2}$  to 3 inches, but the female is much larger than her mate, and very differently coloured. The female is ochre-yellow, with a spot on each fore wing, whilst the male is rich chestnut-brown. He also has a spot of white on each of the fore wings, and a broad pale yellow transverse band, suffused externally, beyond the middle. This is a bold, strong flyer, and may be seen abroad during daylight. The larva is clothed in thick brownish-yellow felty hair, with black incisions, dotted with white, and a stripe of the same colour upon the sides. The food plants are Heath and other plants, as well as trees. The pupa is contained within a cocoon of a brownish colour.

**Lackey Moth.**—This is a common species, and the larvæ are destructive in gardens and orchards, in some seasons more than others. The adult insect is ochre-yellow on the fore wings, with two brown nearly straight transverse stripes, or brownish-red, and two pale yellow ones; the intermediate space is usually darker. The hind wings are paler, and the fringes have irregular brown spots. The larva is clothed in soft, thin hair, and has a white line on the back, and red, blue, and yellow longitudinal streaks. The eggs are laid round a branch in the form of a broad ring. These hatch in the Spring, and may be seen altogether in a web on fruit and other trees.

**Buff-Tip Moth.**—This is a common species, and has the fore wings silvery-grey. There is a pale yellow spot at the tip, and this extends to the centre of the hind margin, and there is also a small yellowish central spot. The abdomen has brown spots upon the sides. The blackish larva has longitudinal and transverse yellow stripes and bands on the back and sides. It feeds upon Lime, Ash, and other trees.

**Puss Moth.**—Almost every boy who has reared Moths will be acquainted with this remarkable insect, the larva of which is a general favourite. The latter is blackish at first, but becomes pale green when full-grown. The large head is bordered with red, and there is a spot behind it and a streak on the back, varied with greyish-brown or red. There are two curious appendages at the extremity of the abdomen, and the whole form and coloration of this extraordinary larva are

such that the same cannot escape attention. It is a vastly interesting hobby to keep these Puss Moth larvæ, and watch them until they are full fed and then commence to pupate.

The natural food plant is Poplar and Willow. The imago has the fore wings white, suffused with greyish, with dull, dark grey transverse lines. These latter are considerably dentated. The thorax has black spots, and there are two rows of the same upon the abdomen.

This Moth expands from  $2\frac{1}{2}$  to 3 inches.

**Dark Dagger Moth.**—This is a common representative of the Noctuæ group of Moths. It is reddish ashy-grey on the fore wings, with a black branching streak and two longitudinal ones on the elbowed line, the lower one above the hinder angle forming in a cross or dagger—hence the English name. The whitish hind wings have the nervures and hind margin dusted with brown, particularly the female. The larva is dark grey, with red and white spots on the sides. It is clothed with thin hair, and has a yellow dorsal stripe, divided with black. Sloe, Hawthorn, Willow, and other trees constitute the food plant, and the larva will be found feeding in early Autumn.

**Common Dagger Moth.**—This species is more common than the last-named. It is very similar in its general colour, markings, and time of appearance, but is usually larger, rarely expanding less than  $1\frac{1}{2}$  inches. The former species expands from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches. Generally it is paler than the Dark Dagger, as one might assume, but it is difficult to determine with certainty unless the insect has been reared from larva at home.

**Frosted Orange.**—This is a very interesting species, for the female lays her eggs upon Thistles, Burdock, etc., and the larva, when hatched, burrows into the stem, and lives in the pithy interior of the same. The tall Marsh Thistle is a great favourite, and I have examined many of these plants recently and found the Frosted Orange larva and pupa. The Thistle should be cut down at the base, and then the centre of the main stem gently split asunder. The larva seems to work its way upwards, as I have found traces of its wanderings right up the stem, and the pupa towards the top of the plant. The



ENLARGED TO



FOUR



FOUR MOON ASLEEP

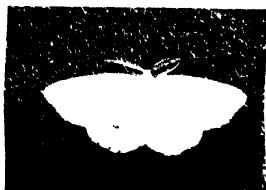
PLATE LXXX



FREBLE-LINES MOTH



BUFF-ERMINE



LE-WAVE MOTH



BRIMSTONE MOTH



MAGPIE MOTH, EGGS, AND PUPA

larva is dull white, with raised black dots; the head and plate behind are brown, and there is a black anal fold. The pupa is reddish-brown.

The larva is much sought after by the Ichneumon Fly, in which she may deposit her eggs, but how it is possible for her to reach the creature when it is securely encased in the thistle stem seems to me very mysterious. Several larvæ I have collected this Autumn have all proved failures, the insects emerging from the pupæ turning out to be some kind of Ichneumon. No less than seven pupæ of this parasitic insect appeared on the old larval skin of one Frosted Orange. One would imagine that the larva would be quite secure in the thistle stem, but experiments I have made prove this to be very often the reverse. The point is, when and how does the female Ichneumon deposit her eggs in the body of the larva of the Frosted Orange? Here is an interesting problem the young entomologist might try to solve.

The perfect insect has the fore wings golden yellow, dusted with rust colour; violet-brown on the hinder part of the basal area and before the hind margin; hind wings yellowish-white.

**Herald.**—This Moth is very abundant, and is sure to come under the notice of the young student. It is reddish violet-grey and yellow on the fore wings, dusted with scarlet at the base and in the centre, with two transverse whitish lines dusted with grey; the hind wings are brownish-grey.

The slender larva is bright green, and has a yellowish stripe on the sides. It feeds on Poplars and Willows, and the pupa should be located between two leaves, which it joins together.

**Common Yellow Underwing.**—We have again had to pass over a large number of smaller Moths, and also a goodly array who, possessing no English names, it is difficult for us to introduce within the scope of this volume even if space permitted. We are thus brought to the present species, which belongs to the Genus *Triphena*. The fore wings vary in colour from dark brown to brownish-red, marked with whitish; the head and front of collar are whitish, or similar to the coloration of the fore wings.

The larva is dull white, or brown when interspersed with

blackish. There are two sub-dorsal stripes with large black spots above them, and a pale stripe of yellow on the back. It feeds on dwarf plants, and is a great pest in gardens.

**Broad-Bordered Yellow Underwing.**—This species has the fore wings olive-green, varied with whitish or violet-grey; the abdomen and hind wings are orange, with a very prominent black band. It is a larger insect than the common species, expanding from 2 to  $2\frac{1}{2}$  inches.

The yellowish-brown larva has a pale line on the back, brown transverse curves bordered with white behind, and a whitish stripe upon the sides. Primroses and other dwarf plants constitute the food plant.

**Lesser Broad-Bordered Yellow Underwing.**—The greenish-brown fore wings of this species are varied with violet-grey, and do not possess any transverse lines. The ochre-yellow hind wings have a black base and a broad sub-marginal band; the head and collar are yellowish-white in front. The reddish-grey larva has a pale line on the back, and black oblique arrow-headed marks of a broader character behind; there is a pale stripe on the sides.

The Wild Arum, or Cuckoo Pint, commonly known as Lords and Ladies, is the food plant, and upon this the larva should be looked for during May.

**Angle Shades.**—This is a very common Moth, and has olive-brown fore wings suffused with pale ochreous and pink; the hind wings are yellowish-white, with a dark curved line, and are dusted with brownish. It expands about 2 inches.

The larva is green or brown, obliquely streaked with a dark colour on the back and a white stripe on the sides. It feeds on dwarf plants, and may be found from Autumn to May, and again in July and August.

**Old Lady.**—This curiously named Moth belongs to the Genus *Mormo*, and is the only European species. The fore wings are dark brown, shaded with purplish; there are various black and lighter lines upon these, whilst the hind wings are dark grey, with two yellowish-grey transverse stripes in the middle, and before the hind margin. It expands about  $2\frac{1}{2}$  inches. The yellowish-grey larva has three light lines and

dark spots on the back. There is a long light line on the sides.

The food plants consist of Willow, Alder, and other trees and plants, and the larva appears to be of nocturnal habits. The perfect insect may be observed in the daytime resting in dark places, or on dark objects, and when thus found is very protectively coloured.

**Burnished Brass.**—The Moths belonging to this Genus, *Plusia*, often have metallic colour on the fore wings, and I have selected this species as a common and worthy example. The violet-brown fore wings have two broad brassy-green bands, and these cover a good portion of the wing. When seen in a good light, the metallic effect is very beautiful. The hind wings are brownish-grey. The pale green larva has fine white lines on the back, and a white stripe upon the sides. Nettles and other low plants form the food plant, and the larva may be found in May and July.

**Silver- $\gamma$  or Gamma.**—This little species has acquired the name of Silver- $\gamma$ , because of the curious mark upon the fore wings. These latter are violet, grey, and brownish-grey, and have a rust-coloured spot, slender transverse lines, and a silvery spot shaped like the Greek letter  $\gamma$  before the centre. The pale grey hind wings have the hind margin broadly marked with brownish. This is both a diurnal and nocturnal Moth. The green larva has fine-waved longitudinal lines on the sides, and a slender yellowish stripe beneath.

**Red Underwing.**—This fine Moth belongs to an entirely different Genus to the Yellow Underwings already dealt with—namely, the Genus *Catocala*. It is a large species, expanding to about 3 inches. The brown and grey fore wings are dusted with blackish, and these are strongly contrasted against the rich red hind wings. These latter are bordered with black, and have also a black central band. The larva is greyish above with yellowish and a darker colour, while underneath it is blue with black spots. It feeds upon Poplars and Willows. The under surface of the perfect insect is very beautiful, and will amply repay examination.

We now come to the *Geometra*, or Geometer Moths, which



are so called because of the curious manner in which the larvæ "loop" or "measure" as they walk along. Of the large number of species included in this Group, it is difficult to make a selection. An account of a few of the commoner kinds must therefore suffice.

**Brimstone.**—This is a very pretty little Moth, having sulphur-yellow wings with rusty red spots on the fore wings and a brown border. The larva is brown or green, spotted with a paler colour. It feeds on the Sloe and Hawthorn, and may be found almost continuously throughout the year, there being a succession of broods.

**Early Thorn.**—The pale, ochreous-grey wings of this Moth shade into violet-grey. It expands from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The grey, or brown, larva feeds on Willow, Alder, etc.

**Scalloped Hazel.**—This Moth has greyish-brown, or yellowish-brown, fore wings, with two dark brown transverse lines, with whitish border behind; the paler hind wings have a dark transverse line beyond the centre. There is a dark ring of brown in the middle of each wing. It expands from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The larva is either pale or dark green, irregularly marked with a darker colour. It feeds on Poplar, Sloe, etc., and should be sought for from early Autumn to October.

**Scalloped Oak.**—This is another common Geometer Moth, and feeds on Willow, Oak, etc., from Autumn until May. Care should be exercised by the young lepidopterist if he rears this insect, as it is a cannibal, and should be kept separate from other species. The fore wings are pale ochre-yellow, somewhat darker towards the middle. There are two brown transverse lines which have a lighter colour on the borders. The paler hind wings have an indistinct central line. The brownish-grey larva is spotted and dusted with brown.

**Magpie.**—The larva of this Moth, like that of the Small Garden White Butterfly, the Frosted Orange Moth, and several others, is often resorted to by the Ichneumon Fly in which to deposit her eggs, and I have before me as I write five pupæ of the Ichneumon which passed their larval state in the body of a Magpie caterpillar. This Moth is white on both wings, dotted profusely with black, but mostly on the fore wings.

The head and thorax are bright yellow, marked with black, and there is a sprinkling of the same colour on the fore wings. It expands from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The white larva has black transverse spots on the back, and a stripe of orange-yellow on the sides, spotted with black above and below. It is a destructive caterpillar, feeding upon Currant, Gooseberry, Sloe, etc.

**Winter Moth.**—This species will be found on hedges and bushes from October to December—hence its English name—while the larva feeds on trees in May. This latter is green in colour, with three longitudinal white lines on each side. The male is much larger than the female, and has reddish-grey fore wings, marked with indistinct dark wavy lines; the paler hind wings have an indistinct stripe in the middle. The fore wings of the female are very short, brownish-grey in colour, with two dark transverse stripes.

**Garden Carpet.**—Passing over the small Pug Moths, of which there are a large number, we come to one of the commonest Moths of all—namely, the Garden Carpet. The pale grey fore wings are waved with a darker colour, and have a black central spot; there is also a dark grey marking; the hind wings are pale grey, and the hind margins have black dots. The brown larva has dark X-shaped marks upon the back, and there is a blacker line on the sides. Garden Cabbages are a favourite food plant of this species, and it will be found upon these and other plants from June to September.

**Phoenix.**—Another common Moth, the Phoenix, has brown fore wings with a zigzag band before the centre; the margins are paler, and the central portion has broad, rounded projections behind, and a border of white; the grey hind wings have three light zigzag lines. The brown, or green, larva is thickened on the third segment, and this is reddish-brown, spotted with white. Segments five to eleven have triangular spots bordered with red. It should be looked for on Currant, Gooseberry, Sloe, etc., in May and June.

**Chimney Sweep.**—This insect is so-called because of its black wings. These are unmarked save for a white fringe at the tip of the fore wings. It expands from 1 inch to  $1\frac{1}{4}$  inches. The larva is green, and feeds on Parsley during May.

Although there are a large number of species of Micro-Lepidoptera, their small size and great abundance preclude their inclusion here, and if the young entomologist devotes attention to the selection of the larger Butterflies and Moths—known as Macro-Lepidoptera—which has been made, he will, until he becomes more proficient in the study, find his time fully occupied, and a wonderful storehouse open to him for further research on his own account.

#### **Orders VI. and VII.—HALF-WINGED AND TWO-WINGED INSECTS**

We now come to the last Order of insects with which we set ourselves out to treat, and, although there are not a large number of species which call for special mention, several of them are exceedingly interesting and well known.

The Half-Winged Order contains the Bugs and Frog-Hoppers, and the Two-Winged Order contains the Flies, etc. These Orders are again subdivided and split up into groups, etc. For our present purpose, however, we need not concern ourselves any further with this exhaustive classification, but pass on to consider the chief characteristics of the more common species.

**Bugs.**—The Bugs are the first insects with which we have to deal, and these are of various kinds. There are Shield Bugs, Pentagonal Shield Bugs, Plant Bugs, Bed Bugs, and Water Bugs.

Mr. Kirby says that "True Bugs have their fore wings of a horny texture, but generally overlapping, and the extremities form a transparent membrane, resembling that of the hind wings. They have a long sucking proboscis curved down beneath their bodies, and their antennæ usually consist of only four or five long joints. Most are vegetable feeders, but some species feed on the juices of other insects, while a few attack warm-blooded animals, either casually or habitually."

**Shield Bugs.**—The Shield Bugs have acquired their name because of the shield or plate which covers the whole of the wings, thus affording the insect protection. When seen for the first time the effect is very striking, and the observer might

imagine that the insect had a malformation of some kind. We have only a few kinds of British Shield Bugs, and these are small. In warmer climes there are a large number. These are of beautiful colour, and some are almost an inch in length.

**Pentagonal Shield Bugs.**—The Pentagonal Shield Bugs have been given this curious name because the shield is often only half as long as the abdomen. This being so, a broad triangle presents itself, which is occasionally broken at the sides, so that a five-sided plate is formed which lies above the bases of the wings.

Search should be made for these insects among bushes, as there are several species which inhabit England. They are brown or green in colour, and about  $\frac{1}{2}$  inch in length.

The food is made up of the juices of plants as well as soft insects.

There are several more kinds of Plant Bugs, many of which are small in size, and only a detailed study of them can be of service. Some are narrow and delicate species, others have more transparent wings, such as the Lace-Winged Bug; and although several of these Plant Bugs are destructive, perhaps the greatest dread of the housewife who is of a cleanly nature is the detestable Bed Bug.

**Bed Bug.**—This insect is reddish-brown in colour, and, where it is found, seems to thrive enormously. I have come across isolated specimens many times, but several houses known to me have been inhabited by countless numbers of these very distasteful parasites. They appear nocturnal in their habits, and although I am thankful to say I cannot testify personally to the truthfulness of the statement—I having made observations upon the insects, but not them upon me—I understand they carry out their ravages at night-time when a person is slumbering. The proboscis is thrust into the body, and blood is sucked up, much to the discomfiture and pain of the sleeper when he or she awakes.

It is believed this insect came from Africa not such a great while ago. It would have been a good thing if it had never come at all.

It emits—like the Pentagonal Shield Bugs—an offensive

smell, and, preying as it does upon the human body, should be kept under at all cost. This does not, however, appear such an easy task, and I have known at least two very clean families who simply could not rid the house of these distasteful inhabitants, and had to remove elsewhere.

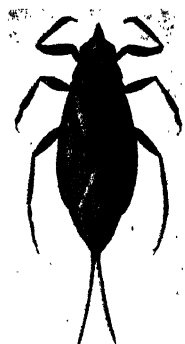
Many other kinds of animals besides man are preyed upon by other species not very distantly related to the Bed Bug, and I have seen some animals simply alive with these creatures.

**Masked Bug.**—It should be stated that the Cockroach is an enemy of the Bed Bug, so also is the Masked Bug, and care should be taken to distinguish one from the other, or the housewife may after all be destroying her best friends. The Masked Bug reminds one somewhat of the Water Scorpion, shortly to be described. It has black wings, and is about  $\frac{3}{4}$  inch in length. It feeds on insects of various sorts, especially soft-bodied kinds, and at times will also attack warm-blooded animals. The larva is insectivorous, and has the habit of covering its body with dust, or fluff, in order to creep upon its prey unnoticed.

Although there are several families of Water Bugs, there are not a large number of species. Those which we have in this country are slender insects, possessing long, thin legs, and may be observed running on the surface of a pond or other water.

**Water Scorpions.**—These interesting insects are very closely related to the last-named, and are so called because the long front legs are somewhat similar to the nippers borne by the Scorpion. We have two species of Water Scorpions in England. The commonest of the two is brown in colour, with red on the under part of the abdomen. The breathing tube is well worth examination, for it protrudes from the end of the abdomen, and would probably be mistaken for a tail. It is composed of two parts, and when the insect is carefully watched in its natural condition, or is placed in water, the air-bubbles can be plainly seen as the insect comes to the surface to breathe. It is about 1 inch long over all and  $\frac{1}{2}$  inch across. It is to be found in stagnant water, but not exclusively, as I have noticed it in running streams.

The second species is a longer and yet much more slender



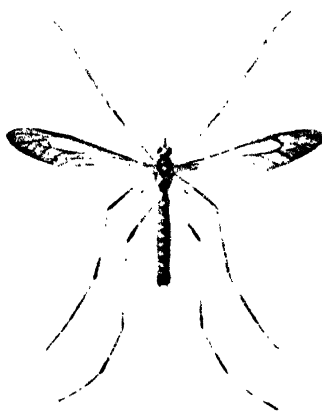
WATER SCORPION



GULL BOTTLE FLY



WATER SCORPION



CANE FLY OR DADDY LONG LEGS



EGGS OF HOUSE FLY



insect. It is yellowish-brown, and should be sought for among mud in deep water.

**Water Boatmen.**—There are several species of these insects, and the chief characteristic is that they have the habit while floating on their backs of rowing themselves about by means of the long, hairy hind legs. The body is smooth, the colour is yellowish-brown, and these insects usually measure about  $\frac{1}{2}$  inch in length. A very engaging time can be spent around some sequestered pool watching these creatures and the Water Scorpion, and if the young naturalist has never done this he will find himself introduced to a new field of wonder and delight.

**Frog-Hopper.**—The little insect found among grasses and in our gardens enveloped in a frothy mass, and later as a remarkable little insect acrobat, is deserving of mention here. It is known in many parts of the country as the Cuckoo Spit, because at one time the froth within which the insect is embedded was supposed to be the saliva of the Cuckoo.

If the little creature found inside the froth is examined, it will be observed to be soft to the touch and yellowish-green in colour. This is the larval state. When the pupa is seen it will be noticed that rudimentary wings have been formed, and in this way one may distinguish between the larva and the pupa. Exactly what purpose the frothy substance serves has never yet been satisfactorily settled, and there is good scope here for the young naturalist to be of some service to scientific research. When in the adult state the Frog-Hopper is brown and grey, with two obscure white spots on the brown upper wings. It is a most remarkable hopper, and I have often tried to calculate how far a man could leap in proportion if he had similar powers!

We must of necessity omit any detailed review of a number of small insects, such as the Aphides, or Green Flies, so destructive to Rose-trees, in Hop gardens, and elsewhere. Many of these are to be numbered among the fruit-grower's greatest enemies.

There are various kinds of Scale Insects that are also very injurious, and after them in the scale of animal life comes the True Lice, the mere mention of which must suffice.



### Two-Winged Insects

We now come to the Two-Winged Insects, or Flies. The species under this Order have only two wings instead of four, which is the usual number possessed by insects, as the young entomologist will already have learned earlier in this chapter.

Passing over the Wheat Midges, the Gnats (called Mosquitoes *out* of England), Sand Flies, and others, brings us to the Crane Flies, or Daddy-Long-Legs.

**Daddy-Long-Legs.**—This insect is well known by sight to almost everyone. It is also called the Crane Fly. It is a harmful species, the larvæ feeding upon the roots of grass, and doing much damage in cultivated areas. The general form of the adult insect need hardly be detailed. It is greyish-brown in colour, with long, thin legs and slender body. The female has a short, horny point at the end of the abdomen. This is the ovipositor, and it is often a ludicrous sight to see her bobbing up and down in a grass field selecting a suitable spot to deposit her eggs. The loss of a leg or two to Daddy is of little, if any, consequence, and if the young naturalist wishes to study the most wonderful subject of autonomy he might well have the Daddy-Long-Legs as his first patient. It feigns death in a very realistic manner, in a similar way to the Devil's Coach Horse Beetle and other insects.

There are two other species of Crane Flies which may be mentioned; one has the wings marked with brown variegations, and another kind may be known by the yellow markings towards the end of the body.

**Flies.**—Coming to the more typical Flies, these will be found to possess broader and shorter wings; shorter, thicker, and more hairy legs; only three- or four-jointed antennæ; and often have long, slender bristles at, or before, the termination of the last joint.

**Gad Flies.**—These insects vary in size, for, while some are only as large as the Common House Fly, others have broader wings, and are of a grey, black, or yellowish colour, and as large as, if not larger than, Wasps. They may be seen in the fields, especially where there are cattle, and will also pay their

respects to our own persons. When they do, irritation of a distasteful nature is set up as a result of the puncture made by the proboscis possessed by even the small kinds.

The Golden-Eyed Flies may be reckoned among the prettiest of these Gad Flies. They are black in colour, but the yellow-marked abdomen and golden-green eyes, lined and dotted with purple, cannot fail to arrest attention. The wings are black, or black and transparent. These Flies are fairly stout, and measure about  $\frac{1}{3}$  inch in length.

Another member of the Gad Flies is known by the name of Blood-Sucking Rain Fly. This is a long and slender insect, and measures about  $\frac{1}{2}$  inch in length. It is greyish in colour, and the male is marked with reddish on the sides of the abdomen. The greyish-brown wings are dotted with whitish, and there is a white mark near the tip.

**Other Flies.**—There are a number of different families of Flies that might engage attention, such as the Robber Flies, that feed on smaller Flies and other insects; the brightly coloured Hover Flies, which resort to our gardens and clearings in woods; and the Bot Flies, whose characteristic habit is being parasitic on warm-blooded animals. Not only does the larva find a congenial home in the skin of an ox or a cow, but will also pass its existence in the inside of a horse, or in the nostrils, or other cavity, in the head of a sheep or a deer.

This brings us to the Horse Flies, and of these and their allies there are a very large number. With these it is not possible for us to deal, and we must of necessity conclude the present portion of our work by setting out the salient features of the House Fly, the Blue-Bottle or Blow Fly, and the Noon-day Fly. After them, if we had the opportunity of carrying our scheme further, we should reach the Cow-Dung Flies, Forest Flies, Bird Flies, various Insect and Mammal Parasites, and lastly the Fleas, these latter being a small group of minute wingless creatures, whose leaping powers are known to everyone, but especially to those who try to catch them.

**House Fly.**—Too well known to need a general description, the House Fly is looked upon as a pest, especially when it is found in large numbers, as is so often the case in certain

seasons. These House Flies, I notice, have a special liking for certain rooms, and never wander far away when once they find a room where the conditions are suitable for them. Accused, often unjustly, of disseminating disease, it seems that, according to Sir James Crichton-Browne, there is much truth in a good deal of what has been stated; for in the course of his address to the Sanitary Inspectors' Association at Liverpool in September last, the passage which attracted most attention was his denunciation of this insect. After a brief sketch of Manson's famous discoveries in regard to Malaria and Mosquitoes, Sir James comforts us for a moment by remarking that in this climate we need dread no harm from suctorial insects. But on the legs, body, and mouth of a single House Fly have been discovered 100,000 fæcal bacteria, and Dr. Jackson, of New York, has been able to establish a direct relation between the prevalence of House Flies and the mortality from typhoid and kindred ailments:

"Whatever the complicity of the Fly may be in the raids of pathogenic bacteria, it is indisputably a vexatious pest, and may, in this highly nervous age, impair health by the irritation and broken rest it causes. The practical proceedings which a study of its life-history suggests are the removal of all horse manure, its favourite breeding-place, and other excremental products as speedily as possible, and certainly within eight days, the time occupied by the development of the Fly; the substitution of water carriage for the older conservancy methods where that is practicable; the frequent clearance and cleansing of streets and courts, and of ash-pits, middens, and pails where these are in use; the abolition of public tips in the immediate neighbourhood of towns or dwellings; the employment of destructors of sufficient capacity to deal with house refuse as it is collected; the reconstitution of the domestic larder, which should be made fly-proof, and kept as scrupulously clean as the operating-theatre of a hospital (we shall perhaps have refrigerating larders one of these days); and the protection and encouragement of birds that prey on the Fly and its larvæ.

"The fight with the Fly," remarks Sir James, "will be a

stiff one, as each can lay 1,000 eggs, and thus, on the snow-ball principle, have 25,000,000 descendants in a single season. The problem would seem insoluble if we did not know in practice that anybody who likes to take a little trouble can keep the nuisance out of his house, and, if only the same care were exercised by his neighbours, the breed would locally become practically extinct."

The adult House Fly is ashy-grey in colour, and the male has a good deal of ochre on the sides. The female is entirely ashy-grey. The eyes are dull reddish encircled with white. The grey thorax is marked with four black lines.

The foot of this common insect will repay examination. It has upon it hairs and hooklets as well as claws, and a pad on the sole. From the latter very small drops of a sticky substance are exuded as the Fly walks on a ceiling or window-pane. These drops quickly dry when exposed to the air, and in this way the insect retains a hold on its position.

The larva, pupa, and perfect insect may be found throughout the year, but, strictly speaking, this is an Autumn insect, and is certainly much more in evidence at that season.

The eggs are laid in large numbers in decaying and putrid matter, horse manure being an especially favourite resort. They quickly hatch (often in one day only), and the dirty-white larva has no feet. It casts the skin twice before it desires to change its form. Then it fasts, the skin becomes hard, and assumes the form of a pupa-case, brown in colour. For some weeks nothing happens, until eventually the perfect insect comes forth, and adds one more to the legion who so often annoy us by their "tickling."

**Blue-Bottle Fly.**—This species is also well known as the Blow Fly. It lives to a very great extent upon dead or decaying matter, the female laying a number of eggs, which soon hatch out into small larvæ. These grow quickly, however, as their appetites are prodigious, and they are favourite bait for Roach, Dace, and other fish beloved by the angler. In the house, and, worse still, in the pantry or larder, the female Blow Fly is an unmitigated nuisance. In a state of nature, however, there can be no doubt this is one of our best insect

scavengers. The larva is born in the midst of decay and filth, and at once proceeds to devour its surroundings, which may consist of animal garbage of which we are well rid. It may be a selfish scavenger, or, rather, a scavenger as a result of selfish motives; but whether it is disinterested or otherwise, it performs good and useful service in the direction indicated.

Several kinds of these Flies visit our houses, and there is a bright green one which comes in the garden known as the Green-Bottle Fly. This latter is also common on hedges.

**Noonday Fly.**—This is a conspicuous insect, and deserves mention in conclusion. It will be seen in the very heat of the day flying round trees, and settling on the leaves and trunks, often in large numbers. It is a near relative of the House Fly, but is larger, and shining black in colour. The male has golden yellow on the sides and under surface of the head. The transparent wings have a slight tinge of pale brown, and there is bright rusty yellow towards the base.

## CHAPTER VIII

Group II.—**MOLLUSCA** (or Shell-Fish)

Group III.—**ECHINODERMATA** (Sea Urchins, Starfishes, etc.)

Group IV.—**POLYZOA** (Moss Animals)

Group V.—**ANNELIDA** (Segmented Worms, Sea Mice, Leeches, etc.)

Group VI.—**PLATYHELMINTHES** (Flat Worms)

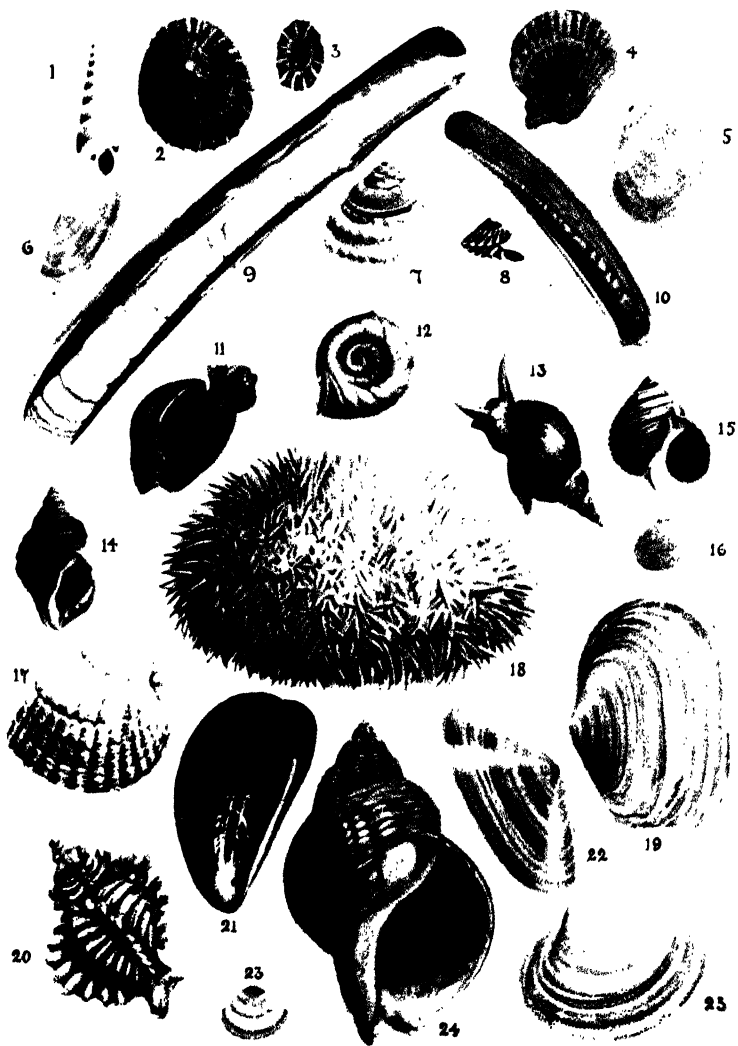
Group VII.—**CŒLENTERATA** (Sea Anemones, Corals, and Jellyfishes)

Group VIII.—**PORIFERA** (Sponges)

Group IX.—**PROTOZOA** (Animalcules)

### Group II.—**MOLLUSCA**

**W**E have now reached the final portion of our task, and among the eight important groups of animals about to be considered there are a very large number of species, many of which are of commercial and economic value. Those



BRITISH SHELLFISH, ETC.

*For Details, see notes*

1. Tower Shell (*Turritella communis*)
2. Common Limpet (*Patella vulgata*)
3. Tortoiseshell Limpet, under side (*Acmaea testudinalis*)
4. Variable Scallop (*Pecten varius*)
5. Natica (*Natica monilifera*)
6. Donax.
7. Great Top (*Trochus zizyphinus*)
8. Grey Top (*Trochus cinerarius*)
9. Pod Razor (*Solen siliqua*)
10. Sword Razor (*Solen ensis*)
11. Viviparous Pond Snail (*Patulinia vivipara*)
12. Ramshorn Snail (*Planorbis corneus*)
13. Common Pond Snail (*Limnaea stagnalis*)
14. Purpura (*Purpura lapillus*)
15. Common Periwinkle (*Littorina littorea*)
16. Periwinkle (*Littorina obtusata*)
17. Common Cockle (*Cardium edule*)
18. Sea Urchin (*Echinus esculentus*)
19. Mya (*Mya truncata*)
20. Sting Winkle or Murex (*Murex erinaceus*)
21. Mussel (*Mytilus edulis*)
22. Mactra
23. Tellen (*Pellina balthica*)
24. Common Whelk (*Buccinum undatum*)
25. Cyprina (*Cyprina islandica*)

animals coming under the head of Mollusca are the most important of the invertebrate sections in regard to their number, variety, and usefulness, and no less than about 50,000 distinct species of living Molluscs have been recorded. Most of these resort to a marine life, but a large number are inhabitants of fresh water. Others, again, like the Snail and the Slug, are adapted for a terrestrial existence. To Mr. Alfonzo Gardiner's most useful little booklet on "Marine Life," I am largely indebted for much of the information set out in this section.

All the animals belonging to the Mollusca have a soft body (Latin *mollis* = soft), which is often encased in a hard shell. The shell is an outside skeleton, and its chief function is to protect the body.

Generally Molluscs have no limbs, as usually understood; their bodies are flabby, and have a soft skin, which often hangs round them in thick folds, forming what is called the "mantle," as in the Oyster and the Clam.

The shell is made from lime, which the animal gets from the water in which it lives, and spreads around its body by means of the "mantle" in layers on the inside.

The blood of Molluscs is nearly always colourless, but sometimes it is a light blue or greenish tinge.

Most Molluscs have but small powers of moving from the place where they grow, though a few have considerable powers of locomotion.

Molluscs are divided into two great sections, viz.:

1. Molluscs having a head (*Ceph'-a-lous*).
2. Molluscs having no distinct head (*A-cep'h'-a-lous*). Greek *kephalē* = a head, *a* = without.

The Cephalous Molluscs are divided into three groups, viz.:

1. *Ceph'-al-o-pods*, or head-footed (Greek *kephalē* = a head; *pous*, *podos* = a foot), in which the head is surrounded by eight or ten long arms covered with "suckers," enabling the animal to creep about head downwards at the bottom of the sea. These creatures exist in the seas throughout the whole world. They have no outside shell. The Cuttle-Fish and the Squid



are the chief ten-armed Cephalopods. The principal eight-armed Cephalopod is the "Argonaut," or "Nautilus."

The Cuttle-Fish is a strong, hideous creature with a large head, two great eyes, and a strong horny beak. When irritated, it emits a black liquid, which darkens the water around it, and thus enables it to escape from danger. From this black substance Sepia is made.

2. *Pter'-o-pods*, or wing-footed (Greek *pteron* = a wing; *pous*, *podos* = a foot). These Molluscs swim by means of two wing-like fins. They exist in large numbers near the surface of the ocean, and are the principal food of Whales and sea-birds.

3. *Gas'-ter-o-pods*, or belly-footed (Greek *gaster* = the stomach; *pous*, *podos* = a foot). These animals mostly live in a single shell—*i.e.*, a shell consisting of only one part (as opposed to a double shell, such as that of an Oyster), which is called, therefore, a "Univalve" (Latin *unus* = one; *valva* = the leaf of a folding-door; the double shell of an Oyster represents the two leaves of the door). In most cases these Molluscs have a broad, flattened "foot," upon which they creep. An immense number of Gasteropods are found in the sea; some also live in fresh water, and some on the land.

*Shells and their Inhabitants.*—It will help considerably in understanding the formation of Shells, and the reason of some of the peculiarities found in them, to have a few general ideas of the Molluscs living in these shells, and the simplest way is to examine some ordinary Mollusc with which nearly everyone is acquainted, such as the Oyster, the Periwinkle, the Mussel, the Cockle, etc.

On opening an Oyster two nearly transparent flaps are seen.

These two flaps are called the "mantle," and they enclose the animal between them. In the Periwinkle the mantle is all in one piece, and is more like a nearly transparent tube, out of which the creature pushes its head. Out of the same tube the Periwinkle also pushes its "foot," and along with the "foot" is a kind of horny lid called the "operculum" (Latin *operculum* = a cover, a lid). The use of this lid is to close the shell when the animal feels so disposed, but all Molluscs that live

in a univalve (or single shell) have not such a door to their house.

Many bivalves have unequal shells, the deep valve being the lower shell, and the flatter one the upper shell. When the Oyster is opened, the upper shell is thrown away, and the Oyster is loosened and left on the lower or flat valve. When the Oyster or Periwinkle is very young, it is not much larger than the head of a pin, and the shell looks very much like a transparent bead, but as the creature grows larger, it is necessary for its house also to be enlarged. The creature therefore stretches out its mantle till it reaches over the edge of the shell. Out of the mantle oozes a very thin fluid, in which there are exceedingly fine particles of lime that have passed through the body of the creature. The thin film of fluid clings to the inside of the shell, spreads over its edge, and, forming a new layer of limy substance, adds a new rim to the shell. This new rim is often white inside, but is not infrequently covered with little cells of coloured or of dark pigment, which are also produced by the mantle.

As the shell has now become larger and thicker, no further deposit is made on it until it is necessary for the creature to enlarge its residence again, and then the same process is repeated. Thus a shell grows, and thus do all Molluscs build up the house in which they live.

In the case of *Acephalous Molluscs*—that is, Molluscs without a head, such as an Oyster—each half of the mantle adds successive layers to its own valve, and in this way all those Molluscs which have no head, and which are all bivalves, produce their shells. *Cephalous Molluscs*—that is, those which have a head, such as Periwinkles, Whelks, Snails, etc., having the mantle in one piece—grow univalve shells only.

From peculiarities of the mantle arise the different shapes, colours, and forms of all the various shells known. If the mantle is crumpled at the edge or drawn out in folds, then the shell that the creature lives in will have a crumpled form and be ribbed, as in the *Scallop*, or it may have horns on some of the whorls, like the *Melo diadema*. When the creature lives in shallow water or on the edge of the shore, where it can bask

in the sun, then the shell is often bright-coloured, and almost universally it is found that shallow water shells, and those from the tropics, where the sunlight is so bright; are more brilliantly coloured than those which are found in deep waters or in parts of the world where the sun does not shine so brightly.

If the mantle leaves a smooth layer of lime on the inside of the shell, this layer will generally be white; but if the film of fluid which the mantle gives out is crumpled into very, very fine folds, the layer also partakes of this crumpled character, although the ridges may be so fine as to be imperceptible to the eye or the touch. These fine folds reflect the light, and give rise to those beautiful colours which we find in "Nacre," or "Mother-of-Pearl." If a little grain of sand or other hard substance gets into the folds of the mantle, as is frequently the case in some Oysters and Mussels, then the mantle sets to work to allay the irritation caused by the presence of the intruder by surrounding the irritating substance with layer upon layer of lime, so that gradually we get a *pearl*.

In Insects, Crabs, and most Molluscs, the organs are in pairs—that is, the right side is very much like the left—but in the univalves the symmetry of the eyes, the tentacles, and other organs of the head, is lost in the body of the creature. The heart consists of a single chamber only, and is placed on one side. There is in general only one set of gills, but this is not universal, for in the Nautilus there are two pairs of gills developed symmetrically on each side.

There is a tendency in all Gasteropods to grow in a spiral form, but it is curious that in most cases the direction of the spiral is from left to right, following the course of the sun. This forms what is called a dextral spiral or a right-handed shell, the spiral being like the thread of an ordinary screw, but this is not always the case.

Although most shells take a spiral form, the spiral differs very much, and naturalists have not yet discovered anything which accounts for the various alterations and peculiarities of shape.

As the shell grows, the animal sometimes moves down from

the upper whorls. When the creature is young the edge of the shell is thin, but with age it thickens into a rib, or is toothed and curved. The mouths of different shells show an immense variety of shapes, ranging between a parallel gash, as in the *Cowrie*, and an almost complete circle, as in the *Turbo*, and may be either with or without a *notch* or *canal* through which the "syphon" extends. When there are two notches or canals in a shell, one of them is for the syphon, while the other carries the vent.

In a vegetable feeder, the mouth of the shell, as a rule, is not notched, the notches or canals being generally distinctive of those Molluscs which are carnivorous. It is usual, too, for vegetable feeders to have the mouth on the surface of the head, while flesh-eaters carry the mouth on the proboscis.

The mouth of the animal is furnished with lips, and inside the mouth is a long ribbon, called a *radula* (Latin = a rasp or file), with which the food is scraped into fine particles before it passes down the gullet into the stomach. The teeth with which the *radula* is furnished are marvellous in their shape and number. Whilst the Whelk has only about 250 teeth on its *radula*, the Common Snail has about 15,000. The *radula*, too, varies in length. In the Periwinkle it is  $2\frac{1}{2}$  inches long, and has 600 rows of teeth. Lamellibranchs have no *radula*.

In bivalve shells the two valves are united by a hinge, and one or more strong muscles near the middle of the animal; these are fixed at each end to the valves, and enable the creature to close the shell securely. Inside the empty valves of an Oyster is seen a nearly circular scar, a little nearer to one side than to the other; this shows where the muscle has been attached.

Bivalves are never found living on the land, and although many of them, as the Oyster, etc., are able to live for some considerable time when the tide has left them high and dry, they are aquatic, and, with only a very few exceptions, live in the sea, and are sedentary in their habits, often resting on the edges of their shells in an erect position, or, like an Oyster, lying, as it were, on their backs.

Many bivalves burrow. With their strong muscular foot

they dig for themselves a hole in the sand or mud in which they lie, leaving only one end of the shell exposed to admit a current of water to flow through their breathing tube, or syphon, which tube also conveys to the animal within the shell a constant supply of particles of food.

The foot, as it is called, is a most important part of the structure of a Mollusc. It is a strong muscle, varying in shape in different Molluscs. Sometimes it helps the creature to move about with a succession of long hops, as in the Cockle. Some of the Molluscs use the foot as a sand-plough, some as a fin to swim with, some as a spade to dig with, and some as a trowel to bore a hole with. In some Molluscs the foot is nearly absent.

We may now proceed to describe a few common species of British Molluscs, and this brings us at once to the Octopus.

**Octopus.**—Although we do not possess any very large British species of this extraordinary creature as compared with the monsters found in other seas, specimens having arms from 2 to 2½ feet in length are forthcoming. These arms are provided with a number of complex sucking-discs. By means of these arms the Octopus seizes and retains its prey, and is also able to walk over smooth, perpendicular, or overhanging rock surfaces.

It also possesses many other interesting features, among which may be mentioned the gland which secretes an inky-black fluid, as in the Cuttle-Fish already mentioned. This is discharged in the water when the creature is desirous of making good its escape, the dark colour of the water caused by the ejection of the inky-black fluid enabling the Octopus to get away unnoticed.

The food consists of Lobsters, Crabs, and similar marine creatures. The shells are broken by means of the creature possessing a very powerful horny beak.

The Octopus hides itself mostly among rocks, throwing out its sucker-arms after food when some comes within reach. It is very difficult to dislodge from its hiding-place; indeed, where large kinds are found, instances have been recorded of bathers being seized by these animals. Once in their grasp

it is a difficult, and often impossible, task to get free again, for a hold is obtained upon the rocks by reason of the hundred-suckered arms, and the others are entwined round the body of the human victim.

**Squids and Cuttle-Fishes.**—The late Mr. Saville Kent states that these animals, “with their large, lustrous eyes, are especially adapted for an open-sea life, and for this purpose are furnished with lateral, fin-like, membranous expansions. A more important structural distinction is their possession of two supplementary appendages, which, usually retracted within special pouches when not in use, can be shot out to a length at least twice that of the eight ordinary arms.

Both the Cuttle-Fish and the Squid, or Calamary, are also the possessors of an internal calcareous or horny shell, which underlies and strengthens the upper surface. The cuttle-bone, used as a dentifrice and ink-eraser, is the product of the first-named Mollusc. The Ten-Armed-Group, as it is named, with reference to the two supplementary arms, ten in all, possessed by its members, is notable for including species whose dimensions not only exceed those of any other invertebrate type, but whose fully-extended length rivals that of the largest vertebrates.

Specimens of the Giant Squid have been captured in the waters near Newfoundland weighing as much as 1,000 pounds, and having a linear measurement of over 50 feet.

There seems little doubt, as Mr. Saville Kent remarks, that many of the so-called Sea Serpent stories that are told have their origin in these large Squids; especially when they are seen in combat with a Whale, some kinds of the latter feeding largely upon these creatures.

**Common Nautilus.**—The Nautilus is a curious Mollusc, one of the *Cephalopods*. It is a kind of Snail, and its house is a shell, which has very many chambers inside, in the outermost of which the creature lives.

The chambers of the shell are separated from each other by little walls (called *septa*), composed of the same substance as the shell. Every one of the chambers formed by these *septa* has in turn been the residence of the animal, and each has

in turn been abandoned as the creature has grown too large for it.

The inside walls of the shells are beautifully pearly. When the shaly covering of the outer walls is rubbed off, the surface which is exposed is like porcelain.

In a full-grown shell there are about thirty-six septa, nearly equidistant from each other, thus showing that the animal grows regularly and gradually throughout life. These septa give immense strength to the shell, so that it is able to resist the pressure of the sea at great depths. Each of the chambers formed by the septa is partly filled with air and partly with water. These air chambers help to buoy up the shell when the animal is crawling or swimming, or when it requires to rise to the surface of the water.

The Nautilus cannot leave its shell, because at the end of its body there is a long, slender, fleshy cord, called the siphuncle, which passes through a hole in each septum, and is attached to the inner end of the shell.

We know very little about the habits of the Nautilus. It is a deep-water animal, and chiefly inhabits tropical seas, being especially abundant in the Straits Settlements, and also in the Fiji Islands, the New Hebrides, New Guinea, and the Moluccas. The inhabitants of these islands catch the animal in baskets like lobster-pots, for the purpose of food; when cooked the flesh is said to be very good eating.

The old story of the Nautilus filling its shell at pleasure either with air or water, and rising to the surface or descending to the bottom of the sea, is now thought by scientific men to be a mere fable.

The Nautilus is the only living creature of this kind, but in early geological times there were very many kinds, all of which are now found in a fossil state. Of one kind, called the *Ammonite*, which is found largely in chalk deposits in all parts of the world, more than 700 species are known.

**Paper Nautilus, or Argonaut.**—This is not a Nautilus at all, but a kind of *Octopus*. The male has not a shell, but the female has a beautiful nearly transparent shell, marked with many ribs on the outside. This shell forms a kind of cradle,

in which the eggs are sheltered. There are no chambers in it, as in the shell of the Nautilus, nor is the animal fixed to the shell. Two long arms clasp the shell, and enable the animal to vary its position on this little floating boat. The ancients used to say that the Paper Nautilus had the power of lifting its broad arms to the wind, and thus was able to voyage onward; but there is no truth in this story. It forces water from its funnel, or siphon, and so swims backwards, like all the Cuttle-Fishes, or else it creeps along the bottom of the sea. The male is only about an inch long. The female is ten times bigger than her mate.

Nacre, or Mother-of-Pearl, which is found on the inside of the shell of the Pearly Nautilus (as well as of other shells), is largely used for making into buttons, handles of fancy knives, ornaments for papier-maché boxes, trays, etc. This part of the shell is really white, but the way in which the shell grows causes iridescence when the light shines on it. This peculiar appearance is caused by the way in which the rays of light falling on the surface are reflected back to the eye.

The scientific name *Nautilus* is Latin, from the Greek *nautilus*, a form of *nautes* = a sailor. *Pompilius* is from the Latin *pompilus*, which is from the Greek *pompilos* = the name which the Greeks gave to a fish that follows ships, and swims near the surface of the water. The name, therefore, refers to the old idea that this Mollusc spread its "mantle" as a membranous sail to the wind, and so sailed over the surface of the sea.

**Cowries.**—Large numbers of fossil Cowries are found in the British Islands, but the only living British species are the Smooth-Margin Shell, the Poached-Egg Shell, and the European Cowrie. This latter is our only perfect Cowrie, and is found abundantly in the North of Scotland and on many other parts of our coasts. It has a very small shell, which is of the characteristic shape of the Cowrie. It is sometimes known as the Gowrie, the Nun, and the Stick-Farthing.

Of the 150 living species of Cowries, most are found in the Old World, and on either tropical or subtropical coasts.



The scientific name is Latin. *Cypræa* = the island of Cyprus, famous for its worship of Venus, the beautiful one; hence the name refers to the beauty of the shells in shape and colour, and of the creatures inhabiting them, all of which are beautifully coloured and marked. The name *Tigris* = a tiger, and refers to the peculiar markings on this shell, which are somewhat like those on the skin of a Tiger.

**Garden Snail.**—The Land Snails have a well-developed external shell, into which the whole animal can be withdrawn. These snail-houses vary considerably in the form of their spirals, and the whorls are frequently decorated with bright bands of colour. The mouth of the shell is often curiously twisted and toothed within.

In cold countries Snails hibernate in the Winter; in hot countries they sleep during the dry season, coming out with the first rain. In both cases, as the Snail has no operculum (*i.e.*, a cover to the mouth of its shell), it makes a lid with slime and limy matter, which becomes hard. In this temporary lid a small aperture is left, through which the creature breathes.

The creature has a thick mantle which lines the shell, and the head bears two pairs of tentacles, the upper pair carrying the eyes at their tip.

The mouth is furnished with an arched and ribbed jaw, and the outer edges of the *radula* are also toothed like a saw.

Snails appear to have regular resting-places, from which they emerge in the evening, returning to the identical spot next morning, when they have done feeding, much as Limpets do.

There are twenty-five British species included in the Genus *Helix*, but the Garden Snail is one of the most common. Many Snails are very small indeed; some, as the Beautiful Snail, the Rock Snail, the Prickly Snail, and the Plated Snail, can only be seen well with a glass; but of all the land Snails, the Garden Snail is most characteristic of the species.

About April the Snails wake up, push aside their doors, and come out, with a good appetite, to feed on the tender young leaves and plants. In May they pair, and early in June deposit their eggs. The eggs of the Snail are roundish, and are enclosed in a tough shell. They are laid in little heaps



COMMON NAUTILUS



EDIBLE SNAIL



WHITE RIBBED DONAX SHELLS



EGGS OF CODLING



about 100 in number, often in burrows in the soft ground, which are excavated by the foot of the Snail.

The Apple Snail, or Roman Snail, is the largest of our native species, and is often called the Edible Snail. *Pomatia* is not from the Latin *pomen* = an apple, but from the Greek *poma* = a pot-lid, referring to the fact that the Snail closes the mouth of its shell with a solid chalky cover before it hibernates. In the South of Europe, especially in Italy, it is eaten very largely, just as the Periwinkle is in England; and the common Garden Snail is also eaten, both it and the Apple Snail being considered great delicacies, and useful in cases of consumption.

The scientific name is from the Greek *helix* = anything which assumes a spiral shape, as a tendril, a lock of hair, then a spiral shell; and Latin, *aspersa* = speckled, alluding to the colour of the shell.

**Slug.**—The popular definition of a Slug is a Snail that has cast off, or not yet developed, its shell. Slugs appear to be more hardy than Snails, and the Black Slug is a common object in gardens, woods, fields, and hedgerows, doing great damage both to fruit and vegetables. A few days ago I planted eighty young Cabbage plants, and to-day hardly a vestige remains, the whole of the plants having been eaten by these very destructive creatures. The Slugs are all closely allied to the common Garden Snail. They have no true shell, but the head and tentacles can be withdrawn into the body. A few of them have an indication of a shell in the form of a small shield-like plate covering the breathing organs. They shun the light of day, have very voracious appetites, feed at night, congregate in damp places under planks and stones, and around old pumps and wells, in cellars and outhouses. Some of the Slugs are carnivorous, and will feed upon worms and other living creatures, as well as upon their own kith and kin. Some also can lower themselves to the ground from a tree or shrub by means of an accumulation of mucus (slime) at the extremity of the tail, which hardens into a thread.

There are also a number of marine Slugs, which the young seaside naturalist should search for among seaweed and other

places. These are called Naked-Gilled Sea-Slugs, and we have more than twenty species on the British list.\*

In tropical seas these animals have most beautiful colourings, and are of large size. Mr. Kent records one he saw on the West Australian reefs over 10 inches long and 8 inches broad.

**Top-Shell.**—This is so called because the shell is of a conical form, with a flattish base, and is roughly like a top. The shell coils round an imaginary axis, and there are from ten to twelve whorls in a full-grown specimen. The animal which lives in this shell is yellowish, variegated with crimson, purple, and brown. It has a prominent head and large eyes, which grow out of stout foot-stalks, like antennæ. It is a marine creature, and feeds upon seaweeds.

The scientific name is from the Latin *trochus* = a child's hoop, a top; and *zizyphus* = the jujube-tree, the creature being somewhat in colour like the fruit of this tree.

**Whelk.**—The Whelk's spiral shell is very characteristic, and the twist is almost always from left to right (commencing at the apex and working towards the mouth), like an ordinary screw.

The Common Whelk belongs to the spindle-shaped shells, but the spindle shape is nearly lost. This species is widely and plentifully distributed all round our coasts, and there is a great amount of variation in the shell, according to the particular part of the coast where it is found.

The creature has a long tube protruding from the little canal of the shell at the mouth, and turned upwards. Water passes through this tube into a chamber where the gills are, and after passing through them, it escapes through a small siphon. The object of the long siphon is to enable the Whelk to respire freely while burrowing in the sand in search of its food, which consists of small living creatures which bury themselves in the sand and dead animal matter, so that it is a good scavenger.

The Whelk lays eggs, which are clustered in masses, several of them together. When a few have hatched out, they begin to feed on the unhatched eggs, so that it is probable that only about a score of young Whelks issue alive from each cluster.

\* These animals belong to quite a distinct group from the Common Slug.

The Whelk is dredged for, and used as bait by fishermen, and tons are eaten as food.

The scientific name is from the Latin *buccina* = a trumpet, referring to the shape ; and *unda* = a wave, referring to the wavy surface of the shell.

**Periwinkle.**—The Periwinkle has a solid spiral shell, with very few whorls, and a round mouth.

These little Sea-Snails are dwellers on the shore, and are found from the Arctic to the Antarctic regions, wherever they can find rocks and stones to crawl upon. Some occur at low water ; others live only at high-water mark, and one species (in the tropics) has been found hundreds of yards from the sea.

The animal has horny jaws, and a very long *radula* (Latin = a scraper) or ribbon-like tongue, sometimes two or three times as long as the animal itself. As its principal food is vegetable, the *radula* is a great aid in rasping it fine before swallowing.

The eggs, or spawn, are found in little batches on the stones.

The Periwinkle is consumed in immense quantities.

The scientific name is from the Latin *litus*, *litoris* = the sea-shore. "Periwinkle" is from the Middle English *pervenke*, and appears to have reference to the twisted shell, but the origin of the name is somewhat doubtful.

**Limpet.**—All the Limpets, of which there are many kinds, have conical shells, the apex of which is turned towards the front. The head has tentacles, which carry the eyes (as in a Snail), and the foot is as large as the edge of the shell. The gills are concealed at the back of the head. The tongue, or *radula*, of the Common Limpet is longer than the shell, and has 160 rows of teeth, twelve in each row. The creature lives between high and low tide, and adheres so firmly to the rock that it is difficult to detach it without breaking the shell. When the tide is up, Limpets quit their resting-places in quest of food, which consists of various kinds of seaweed, especially *fucus*. As the tide ebbs, they creep slowly back to their homes again. Even hard rock is found to be worn into a smooth concavity beneath the foot of the animal, and the margin of the shell exactly fits the inequalities of the surrounding surface. The inside of the shell is very glossy.

There are more than 100 living species found in different parts of the world, most of which are used for human food, especially in times of scarcity. They are not much eaten in England.

One of the principal enemies of the Limpet is the Oyster-Catcher, a very handsome and engaging sea-bird, whose bill is admirably adapted for wrenching it from the rocks.

The scientific name is from Latin *patella* = a dish, from the shape of the shell; and *vulgaris* = common.

**Fresh-Water Limpet.**—The Fresh-Water or River Limpet is so called on account of the resemblance in form of its shell to that of the true Limpet. It is found all over the world, two species being British. One lives in shallow streams and running brooks, generally on stones, but occasionally on plants. Limpets live together in small families, and are very prolific. The eggs are enclosed in a transparent jelly-like case, which is attached to submerged stones, as well as to the stems and leaves of aquatic plants. Though the shell of the Fresh-Water Limpet resembles that of the Limpet in outward appearance, the creature is in its internal structure a true Snail.

The scientific name is from the Latin *ancylus*, Greek *angkylos* = curved, crooked, rounded, referring to the shape of the shell; and *fluviatilis* = belonging to a river.

**Pond Snail.**—This is sometimes called the Ram's Horn, or Trumpet Snail. The shell differs very much from the spiral shells considered thus far, for instead of a lofty spire, with the whorls one above the other, they are all on the same plane, and the mouth of the shell is to the left. A shell of this kind is called *discoidal*—i.e., flat like a disc. The creature living inside has a short round foot and a short head, and the tentacles are very slender. These Snails are all vegetable feeders.

The Ram's Horn is the largest species of this class of Pond Snail, and is found in almost all parts of England. When disturbed, the creature discharges from a gland in the neck a purple-coloured fluid, probably a means of defence, just as Squids and Cuttle-Fish do.

This species is not so prolific as some of the Snails, and only produces from 60 to 120 eggs in the season, which are laid in a

shield-shaped mass of jelly. Each of these masses contains from twenty to forty eggs, which hatch out in fifteen or sixteen days.

The scientific name is from the Latin *planus* = flat, *orbis* = a disc, referring to the disc-like shape of the shell, and *cornu* = a horn, as a ram's horn, referring to the spiral form.

**Bivalves.**—Those Molluscs that are commonly known as Bivalves (because the shell containing them is a double one, one shell being placed upon each side of the body, and the two valves being united by a hinge) are often called *Lamellibranchs* (Latin *lamella* = plate, and *branchiæ* = gills). The Oyster, the Mussel, the Cockle, and the Scallop are some of the best-known examples. None of the *Lamellibranchs* are ever found living on the land as Snails and Slugs are; though some of them are able to live out of the water for a short time (as the Oyster). Bivalves are, with a very few exceptions, inhabitants of the sea, being found on the shores of every part of the world, and often in deep water.

In most of the Bivalves the shells are unequal, the hollow valve being the lower shell, and the flatter one the upper. The two valves of the shell are united by an elastic ligament or muscle, which in some of the forms is somewhat complicated. Many Bivalves have the edges of the mantles united in one or more places, leaving openings for the foot and breathing tubes to be pushed out.

If the inside of the empty valve of an Oyster be examined, a singular roughly circular scar, a little on one side of the valve, will be found. This is the place where the strong muscle of the creature is attached, the use of which is to close the valves of the shell and hold them tight together.

In animals of this class the gills are flat and leaf-like, usually two in number, one being placed at each side of the body. In an Oyster this is called the beard; in a Mussel, the long, delicate, bunch-like hairs, which are spun from glands by the side of the foot, and which serve as a means of attaching the shell to the other objects, is called the bys-sus (Greek, *byssoi* = fine flaxen thread).

On account of the leaf-like appearance of the gills in this



class of creature, they are sometimes called Lam-el-li-bran-chi-a'-ta.

Bivalves are most abundant in shallow water. Many of them live buried in the sand or mud, or attached to rocks. Some of them live upon seaweed, but most of them upon other small living creatures found in the water.

**Oyster.**—The valves of the Common Oyster are not equal in size and form; what is called the left valve—*i.e.*, the lower one—is large and hollow, and the upper one, called the right valve, is either flat or slightly concave. The left valve, too, is often marked by overlapping plaits and folds, whilst the right valve is frequently plain.

Oysters are found in the temperate and tropical seas all over the world. There are nearly a hundred species, most of which are useful for food.

In the young Oyster the shells are almost round, but as they grow, this shape is considerably modified. At a very early stage the young Oyster becomes cemented to a rock, to an older shell, or to some other object at the bottom of the water, and there it remains a fixture. It has, therefore, no need for a foot (as most of the Molluscs have) either for locomotion, or for spinning a byssus. There is a solitary muscle for closing the valves placed nearly in the centre of the shell.

The Oyster is very prolific. A single common Oyster will often produce over a million eggs. During May, June, and July, the eggs are found in the gills, and there they remain until they are hatched. During this period Oysters are “out of season.”

The Oyster spawns about June, and the “spat,” as the spawn, or young Oysters, are called, resembles very fine slate-pencil dust. The mother Oyster opens her shell, and the young ones escape from the gills in a cloud, which may be compared to a puff of steam from a railway engine. Each little Oyster is provided at its birth with swimming organs, composed of very delicate *cilia* (*i.e.*, very fine hairs, like fine eyelashes), and by means of these the little creature swims about the moment it leaves the shell. When the little Oysters have grown to the size of a sixpence they are called brood. The young Oyster

grows by adding to the margin of its shell a very delicate layer of horn-like elastic substance, almost as fine as goldbeater's skin, but which gradually hardens into shell.

Oysters do not reach their full growth before from the fifth to the seventh year. When they are what is called cultivated—*i.e.*, Oysters grown and tended under protection—they generally reach their full growth in about four years. There are many places round the coast of England where the Oyster is cultivated, the mouth of the Thames being especially noted for what are called Natives. Whitstable, off the north coast of Kent, is also another noted breeding-place, the finest Oysters in the world being dredged there. The abundance of suitable food accounts for the good quality of the Oysters found in that part of England.

The Oyster has many enemies. The spawn is greedily eaten by fishes, and of the larger Oysters the Five-Fingered Starfish is the greatest enemy. It entwines the Oyster in its deadly grasp, and when the shell is slightly open, sucks out the Oyster, leaving the empty shell. The Whelk is also a great enemy: it bores a hole through the shell, and then through this hole eats the creature inside.

The inner lining of the shell of the Oyster is very beautiful, and forms what is called "Mother-of-Pearl." If a foreign body, as a grain of sand, happens to be introduced between the animal and its shell, the Oyster covers over this irritating substance with what is called nacre, the same material with which its shell is lined, and this forms a pearl.

The best Mother-of-Pearl, as well as the Pearls themselves, are obtained from some of the Mussels. All Pearl Oyster-shells do not contain Pearls. There are three principal kinds of these Mother-of-Pearl shells, and the great market of the world is at Manilla, in the Philippine Islands. The best shells are worth from £2 to £4 a cwt.

The scientific name is from the Latin *ostrea* = an Oyster, and *edulis* = good to be eaten.

**Scallop.**—The Pecten or Scallop Shells are not only near relations of the Oysters, but some of them live on the same beds. The shell is more nearly symmetrical than that of the

Oyster (though the valves are usually unequal), yet it is thin, light, and strong. The muscle for closing the valves is very large and powerful. Not only do the ribs of the shell add strength to it, but the two valves so accurately fit together that it is impossible to move them either to right or left. Some of the Scallops are of very large size, and there are many fossil species.

A peculiarity of many of these shells is the development of "ears" on each side of the beak—i.e., the part where the hinge is situated. These also add strength to the shell.

The foot is a very delicate finger-like organ, and the threads of the byssus pass out by spaces left between the ears.

The Quin (or Queen) shell is more nearly circular in shape than many of this class. It lives in sandy places, but is occasionally found among rocks, and has considerable powers of moving about. In some parts of the country this Scallop is used for food.

Sometimes a Scallop, or occasionally a Cockle, shell used to be worn by pilgrims who had visited the Holy Land. The Scallop shell generally used for this purpose is one called *Pecten Jacobæus*, or St. James's Shell. Thomas Parnell, the poet (born 1679, died 1717), says of the hermit :

" He quits his cell ; the pilgrim staff he bore,  
And fixed the scallop in his hat before."

The Great Scallop, or Clam, is found generally round our islands, and is very largely eaten ; but, like all the Scallop family, requires to be cooked, for none of the Scallops are sufficiently palatable to be eaten raw, as Oysters are.

The name Scallop is from a very old French word, *escallope*, or an old Dutch word, *schelpe*, meaning a shell. Quin is probably from the Irish word *cuine* = money, referring to the shape of the shell ; but this is doubtful. Queen is only another pronunciation of Quin.

The scientific name is from the Latin *pecten* = a comb, from the tooth-like edges of many of the shells, and *operculum* = a lid or cover, one valve forming a lid or cover to the other one.

**Mussel.**—The Common Mussel is one of the most useful of all the Molluscs, for not only is it of great use as food for man, but it is one of the best baits for fishermen. The shell is oval ; the valves are both very much alike, the edges fitting very closely.

Most of these creatures are marine, and are attached to some object under water by a byssus.

The Swan Mussel is the most noted of the Fresh-Water Mussels, and is found living in fresh-water ponds and lakes.

Mussels usually fix themselves to piles and stones. They live together in closely packed masses. But although the Mussel is apparently fixed by its byssus, it is not quite a prisoner, as it is able to support itself from these threads, and move about to a slight extent.

Mussels form another of the Oyster's enemies. If the young ones settle on an Oyster bed, they begin at once to spin their byssus and to anchor themselves firmly. The tide brings down mud, which the webs of the Mussels collect, and the Oysters underneath are suffocated.

Mussels are very valuable on many parts of the coast in keeping off the wear and tear of the tide, and so preventing structures being damaged by the rush of the water.

Sometimes Mussels cause illness to those who have eaten them, and frequently death has resulted. The reason for this is unknown. The common saying is that it is the beard—*i.e.*, the byssus—which causes these unpleasant symptoms. The beard should not be eaten, but it is more probable that the flesh of the creature itself is poisoned by the food it has eaten, especially if the Mussels grow in the comparatively stagnant waters of harbours, or near the outlet of sewers.

On many parts of the coast of Europe Mussels are cultivated by placing boughs of trees on the mud. These become quickly covered with the spawn, and after a few years are taken up and sold.

The scientific name is from the Latin *mitulus* = a mussel, and *edulis* = good to be eaten.

**Pearl Mussel.**—Of the very many kinds of Fresh-Water Mussels which occur in the lakes and rivers of the world, both

in continents and islands, the Pearl Mussel is one of the best known.

A very curious thing in connection with the Mussels of the *Unio* family is that the eggs develop into minute bivalves, each valve of which has a little hook on the front edge. When they leave the parent they attach themselves to some object by means of a byssal thread; but as soon as possible they fix themselves to the gills and other parts of fish by means of their hooks, and when they have grown a little larger they leave the fish, sink to the bottom of the water, and gradually assume their full form.

Four of the *Unio* family are found in Great Britain, of which *U. margaritifera* is found in most of the rivers of Scotland, and in the Conway, in North Wales. It is not eaten, but in Scotland is used as bait. In many parts of the Scotch rivers the pearl fishery continued until far into the nineteenth century, and although the pearls are not quite equal to the ones obtained from the Pearl Oyster, many of them are very beautiful. These pearls are occasionally found now, but the fishery appears to have died out because of the uncertainty of finding any pearls of value. Where pearls are found, they are generally in old and deformed shells; but not 1 per cent. of the shells contain a pearl, and not one pearl in a hundred is worth anything. Occasionally pearls regular in form, clear in colour, and about the size of a pea, are found, and these may be worth from £3 to £4 each.

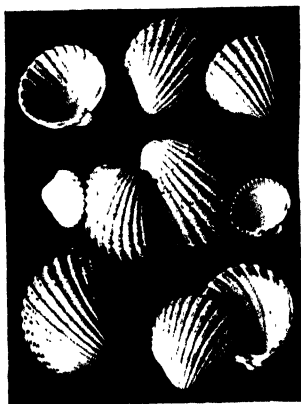
In England the Pearl Mussel does not appear to be found much south of Yorkshire, though it is common in Wales and in the northern part of Great Britain.

The scientific name is from the Latin *unio* = a large pearl; *margarita* = a pearl; and *fero* = to bear.

**Nut Orb-Shell.**—The Orb Shells are called Fresh-Water Cockles; but the *S. rivicola* is not a Cockle at all. The shell is somewhat globular, and the little animal which lives inside is very active, for by means of its foot it can climb weeds, and by spreading it out on the surface of the water, can float with its shell inverted, after the manner of many Pond Snails. From this position the *Spharium* often descends to the bottom



COYIA SHELLS



COYIA SHELLS



AMUSEMENT



AMUSEMENT WITH OBJECTS



of the water by spinning a thread of mucus, which remains attached at the surface to a floating weed.

All the so-called Fresh-Water Cockles hibernate in the soft mud during Winter, and become active again in the Spring.

The common Orb Shell is rather more oval and solid-looking than most of this family, and the interior has a pearly coating. It may be found in all parts of England, in sluggish rivers and canals. Neither the shell nor the creature inside is made use of.

The scientific name is from the Greek *sphairidion*, diminutive of *sphaira* = a ball, because of the spherical form of the shells; Latin *rivus* = a stream, a brook; and *colo* = dwelling, living.

**Cockle.**—In the Cockles the two valves are exactly alike, very convex, with a prominent beak, from which strong ribs radiate to the edges, which are serrated, somewhat like the edge of the *Pecten*. The gills are long and much folded back, and the foot is large. These Molluscs live in the sand or mud between low and high water, and are able to sink rapidly in the sand or rise to the surface by means of their foot.

There are a considerable number of members of the Cockle family, but the most important of all is the Common Cockle.

Cockles are obtained by raking the sand where they breed, and whether to be used as food or as bait, the gathering of them forms a very important fishing industry.

All the Cockle family are eatable, and on the shores of the Baltic and on some parts of the Black and Caspian Seas every one of the species is eaten.

The name Cockle itself is from the French *coquille*, meaning a shell; and this is probably from the Greek *konghē* = the name given to a small Mussel or Cockle.

The scientific name is from the Greek *hardia* = the heart, on account of the heart-shape of the closed shell when viewed sideways; and Latin *edulis* = good to be eaten.

**Razor Shell.**—In the Razor Shell family the two valves are of equal length; they are long and narrow and gape at the end. The animal has a large and powerful foot, which enables it to burrow in the sand very deeply; in fact, the *Solens* (as these creatures are called) bore with such rapidity



and to such a depth that they are very difficult to obtain alive. The hinge ligament is outside the shell, and not inside, as is more usual in Bivalves.

The Solens are found in every part of the world except the colder seas, and most of them are good to eat when cooked.

There are seven species found round our seas, but one of the best-known is the Pod Shell, or, as it is sometimes called, the Spout Fish. An examination of the shell shows how it grows. In most Bivalves additions are made all round from the beak; but the lines on the Razor Shell show that the chief additions are made on each side of the valve, and very few indeed along the front edge, so that the shell becomes long and narrow.

When the sands are covered with water, these shell-fish come to the surface of the sand; but when the sea goes out they retire, often to a depth of 1 or 2 feet. In addition to burrowing in the sand, they have also the power of darting through the water in the same manner as the Scallops do.

Beyond being used as food by the poorer people round the sea-coast, thousands are taken for bait, and to obtain them a hooked iron is used to drag them out of the sand.

Another of the common Razor Shells found round the coast of Great Britain is the *Solen ensis*, or the Sword Razor Shell. It is in most respects like the Pod Shell, except that the shell is curved. *Ensis* is the Latin word for a sword.

The scientific name is from the Latin *solen*, Greek *sōlēn* = a pipe, and Latin *siliqua* = a husk or pod (as a Pea-pod); hence the English name, Pod Shell.

### Group III.—ECHINODERMATA

The *E-chi-no-der'-ma-ta* is a sub-kingdom of Invertebrate animals, and includes the Sea Urchins and Starfishes. The name is given to them because the skin is often furnished with spikes or horny bosses—Greek *echinos* = a Hedgehog, and *derma* = skin.

In most of these creatures the body grows into a series of rays from the central part, where the mouth is situated (as in the Starfishes), and hence at one time these creatures were

termed Radiates, from the Latin word *radius* = a ray. They all live in the sea, and remove lime from the sea-water, building it up into skeletons of very varied shapes, and with many peculiarities.

One great division of the Echinodermata is the *Asteroidea* (Greek *astēr* = a star, and *eidos* = form), which includes the Starfishes.

**Sea Urchin.**—This is a really wonderful inhabitant of the sea, and its whole life and structure are worthy of the closest examination. The shell, or case, in which this animal makes its home is called a shelly test, and bears upon it a large number of sharp spines that radiate on all sides. These spines can be moved about by the owner as he desires, and are not immovably fixed, as in the case of those of the Hedgehog. If the test be deprived of the spines, an idea may be gained of how numerous they are and also of the remarkable pattern-work of this wonderful home of a marine creature. The test is built up of a number of plates, and it is interesting to notice that, as Mr. Saville Kent points out, in many of the structural details of the Sea Urchin the number five dominates in the constituent elements. Every tiny portion of the Sea Urchin's homestead will amply repay examination, and the various parts of which it is constructed should be carefully looked at and studied through a microscope.

This animal has five large, sharp teeth. These have enamel-pointed tips. It also possesses a large mouth. The hundreds of little sucker-feet are protruded from the shell, and by means of these and the movability of the spines the Urchin is able to move about. The animal also uses the sucker-feet for the purpose of protection by pulling down small objects in its vicinity, and so covering itself very successfully. One female produces millions of eggs, and these are exceedingly minute. In due time these become fertilised by the male releasing small white spermatozooids. These latter find the brick-red or orange-yellow eggs set free by the female, and in this way fertilisation is brought about. Soon after this the egg undergoes a change, and in a very short time it becomes a moving embryo.

We have a number of British species, one very small one,

known as the Purple-Tipped Urchin, resorting to rocks, boulders, and similar places along the coast. This species has long and sharp spines. The Common or Short-Spined Sea Urchin is also a common inhabitant of our seas, and large numbers are caught by fishermen and sold at various seaside resorts during the season. This latter species is used for food in Italy and other Continental countries, the contents of the shell being scooped out in the same way as we eat an egg. Sea Urchins are mostly vegetarian in the matter of diet.

**Rosy Feather-Star.** — The Feather-Stars are very beautiful sea animals. They mostly resort to deep water, and are characterised by the habit they possess in either early life, or throughout the whole allotted span, of becoming attached to various submarine objects by means of slender stalks. Along the South Coast, in the little pools left by the tide, the young naturalist may search for this common representative of the group. It has feather-like arms, which radiate from the somewhat small body; the latter being five-rayed. It possesses hooks at the end of the arms, as also radiating joints, and through the agency of these the animal is able to crawl about. It is also able to propel its body through the water in a cumbersome manner "by the consecutive flexion and extension of these appendages."

The Rosy Feather-Star is tinted with bright rose-red, and from this the name has been acquired.

**Common Five-Fingered Starfish.** — This species may be seen in shore pools at low water, or stranded upon the shore. It really lives on the floor of the sea at the depth of a few fathoms. It feeds on young Oysters and other small shellfish, and, in fact, on almost anything living of small size that comes in its way.

The skeleton of the Starfish is worthy of examination, for each of the arms has a number of little shelly plates, which strengthen and support the fleshy part.

This Starfish has been compared to a colony of five Worms, which is not an inapt description, for each worm-like arm is complete in itself, having its own nerves; all the nerves from each of the arms join together round the mouth,

which is found in the centre of the creature, underneath. Each arm also has its bloodvessels, and, to a certain extent, a separate existence; for if an arm be broken off, another one will grow in its place, and the creature will again be complete. A little red eye is found at the tip of each arm, and is exceedingly sensitive to light.

Starfishes can move about fairly rapidly by means of scores of little soft tube feet, which protrude from the curve down the outer surfaces of each arm, these feet being furnished with suckers. The arm fixes itself by means of some of these suckers, and then the rest of the Starfish gently lifts itself forward.

The scientific name is from the Greek *astēr* = a star, and the Latin *rubens* = red, the Common Starfish being of a reddish colour.

**Sun Starfish.**—This notable species is worthy of mention, because it possesses twelve or more arms instead of five, as in the last-mentioned, and has derived its name of Sun Star by reason of its colour, which, Mr. Kent states, somewhat resembles that of a symbolic sun.

It is usually purplish-red in colour, blotched with white. Other specimens may be found to be pure red, and others, again, orange. The upper surface is covered with large spines, and these are separated by spaces. It is through these that the small skin-gills are protruded. The colour, however, is subject to much variation, a remark that applies equally well to several other kinds.

Starfishes, like the Brittle Stars, next on our list, have the remarkable habit of growing new rays if they chance to lose one or more, and if a specimen be cut in two, it commences to grow new rays, and in a short time two animals exist where formerly there was only one.

If you examine a Starfish, have a look for its eyes. These will be found at the extremity of the rays. Some species are also provided with eyelids, so that the eyes can be opened and shut as the creature likes.

The female, having laid her eggs in a little heap, bends her rays over them, and so shields her treasures. When thus

engaged the Starfish presents a curious appearance, and remains thus until the eggs hatch.

**Brittle Stars.**—These interesting animals are so called because of their habit of breaking up or surrendering parts of the body. This is known as autonomy. It is difficult to secure a perfect specimen of this creature, for on the least provocation it simply dislocates its body into fragments. When in the larval condition the Brittle Star ably practises this remarkable habit, for it casts away in regular and methodic manner certain portions of its body during its early life. A search under stones between tide-marks should reveal the presence of *Ophiothrix fragilis*. This species has long arms, but these break off at the least interference, and the wonderful creature shivers convulsively and shatters its body into pieces. It varies in colour, violet, brown, yellow, red, and grey specimens having been recorded. A number of Starfishes emit a certain phosphorescent light of a pale-green or blue colour, and when a number are seen at night the effect is very remarkable.

There are several other species of these animals, such as the Daisy Brittle Star, and the young naturalist intent upon studying some of the many wonders of the sea would find it an entertaining and intellectual occupation to pay attention to these creatures who, in such a wonderful way, dismember their bodies in the manner indicated.

**Sea Cucumber.**—This curious marine animal is greyish-white in colour, and has a feathery tuft at one end of the body. It resorts to dark rock pools, and should there be sought after. It is, as will be presumed, an Echinoderm, and claims kinship with the group known as the Holothurians.

Unlike the Starfishes, the Sea Cucumber does not surrender the outer parts of its body. Instead of this it has the curious habit of throwing out portions of its internal organs when attacked or alarmed.

It will on provocation eject its teeth, its throat-lining, and several of the internal organs, and in this way becomes a mere skeleton. On casual acquaintance it might be presumed the animal would then die, but this is not so, for the ejected organs are replaced with new ones, and in a short time the creature

appears little, if any, the worse for its remarkable adventures. One of our commonest species is known as *Cucumaria lactea*. It measures about 1 inch in length, has a tough skin, and is brown or white in colour. The ten-branched tentacles borne upon the head constitute the feathery tuft already mentioned in passing. At the other extremity the anus will be observed, and between the crown and the latter there are five zigzag rows of tube-feet. It should also be stated that the tentacles in this species are modified tube-feet, because a smaller kind known as *Synapta* has a crown of tentacles only, and lacks the tube-feet present on the body of its relative.

#### Group IV.—POLYZOA

A number of small marine creatures come between the *Echinodermata* and the *Annelida* next to be dealt with, and at first sight may be taken for Seaweed. These are social animals, and some are found in fresh water as well as salt. The so-called Sea Mats, which are bound to come under the notice of the observant boy when rambling by the seashore, are common representatives of these interesting colonisers, but it is only by the aid of the microscope that any adequate idea can be obtained of their structure.

**Sea Moss.**—The Moss Animals, like the Corallines, always live in colonies, the individuals of which are very small, and are joined in a number of different ways to form stocks.

The colonies of Sea Moss form branched, leaf-like lobes, and are often mistaken for Seaweed. Each side of the leaf consists of a layer of closely crowded individuals. The cells in which the little creatures live do not become solid with lime as real Coral does, so that the leaves, when fresh, are elastic, and all the stock is very flexible.

All the Moss Animals live in water, and a great number of species inhabit the ocean at great depths. Some of these creatures are found in fresh water, attached to aquatic plants, but they are usually so small as to be almost invisible.

If a leaf of a specimen be examined with a strong magnifying glass, it will be seen to be covered with little cells, each of which forms the home of a minute but separate animal,

termed a *Pol'-y-pide*. Each Polypide lives an independent existence in the cell or chamber it inhabits.

By means of a crown of tentacles, which it is able to push into the water, it obtains the food and air necessary for its existence.

The scientific name is from the Anglo-Saxon *flustrian* = plaited or braided, though it may be from the Latin *flustra* = the calm sea, and Latin *chartacea* = paper-like, the dry leaves being not unlike brown paper. On account of the colour these creatures are sometimes called Sea Mats, being the colour of a mat made of hemp.

#### Group V.—ANNELIDA

The Annelida or Segmented Worms are at once distinguished from the Arthropoda by having no jointed locomotive appendages. They are nearly all provided with *setæ*—i.e., spines or bristles which are embedded in pits of the skin, and which may be borne on special foot-like projections of the body known as *parapodia*. When there are no *parapodia* the *setæ* may be arranged in groups on the lower surface of the body or may form a circle round each segment.

**Earthworm.**—Those species in which *setæ* represent the locomotive organs are appropriately called Bristle Worms, and to this section the Common Earthworm belongs. On handling the latter the hook-like bristles at once make themselves felt as the creature crawls over the skin, and in a specimen in which the bristles are particularly hooked the sensation, to say the least, is the reverse of pleasant. When I was preparing to go a-fishing, as Walton would say, I used to catch Earthworms as they lay out of the ground on damp nights, so that I have had considerable acquaintance with them. The young naturalist, however, on handling one for the first time would probably be surprised at its bristly nature. The bristles undoubtedly afford the Worm a grip upon the surface it is traversing, and I am of opinion that by means of them the creature obtains a hold in its hole when one endeavours to pull it out. I have tried this in vain some hundreds of times, and only got a portion of the Worm for my

trouble. The Earthworm seems to vary in colour a great deal, but some fine specimens, which are pink, red, and white, are often found in the garden, especially where the soil is well cultivated. We have about twenty different kinds, and it is interesting to notice that, whereas some of these are dull-coloured and sluggish in their habits, the Lobworm and the Brandworm, beloved by fishermen, are beautifully coloured and very active. That is why anglers like them so, the duller and less active species not being in request.

Earthworms are vegetarians, and drag into their holes such things as leaves, straws, petals of flowers, and other vegetable matter. They also partake of their environment—namely, the earth—and in coming to the surface for the purpose of depositing their castings, enrich the soil to a much greater extent, I think, than is generally accredited. Indeed, these useful creatures have helped very largely to make our land the rich and fertile country it is to-day.

There are a large number of Bristle Worms who resort to a marine life, and to these the attention of the young naturalist might with advantage be directed. These Marine Bristle Worms are divided into two groups, the one containing those kinds which, like the Earthworm, can move about at will, and the other those kinds who inhabit a sort of tubular edifice. This may be either calcareous and shell-like, or made up of small portions of mud, sand, etc. In these, and also the *Nereids*, the bristles are much more prominent than in the Earthworm; while in the *Nereids* also the body is more or less flat, the leg-like appendages are unjointed, and are supplemented by bristles, and the creature generally might be thought to be not very distantly related to the Centipede. The *Nereids* also have sharp-pointed, horny jaws, and structures at the end of the body, which may be likened to antennæ. Then, again, in a number of these interesting Worms the lateral organs are flat-like, and by means of them the creatures can swim. These animals attain a length of several feet, and have remarkably beautiful colours.

**Sea Mouse.**—This animal is not a Mouse at all, but one of the Bristle Worms we have been mentioning. It may be



found on occasions cast up on the shore after a storm, and although at first it may not be regarded as a particularly interesting or beautiful object, it will improve on closer acquaintance.

Having found a specimen, wash it in water, and the more it is cleansed the more beautiful it becomes. In the middle of the back there is a felt-like covering consisting of a large number of brownish hairs. Under these, broad, flat scales will be found. These admirably shield the animal's breathing apparatus. The sides of the body are covered with long slender hairs and bristles, and each of these gives off most beautiful prismatic tints, wonderful to behold. The short, thick body is 3 or 4 inches long, by about  $1\frac{1}{2}$  to 2 inches wide. These remarkable Worms burrow in the sand, and I would strongly advise the seashore rambler to search diligently for a specimen after a storm, and see for himself whether I have exaggerated the wonderful colour revealed by the iridescent hairs of this creature.

The second group of the Marine Worms, known as the Tube-Dwelling Worms, are characterised by the coloured flower-like gill-tuft, which is found upon the head in the form of a sort of crown. When a colony of these animals is lighted upon with the flower-like gill-tufts expanded, the effect is very striking, and the young observer may be pardonably excused if he is somewhat confused at first as to the identity of the creatures he is surveying.

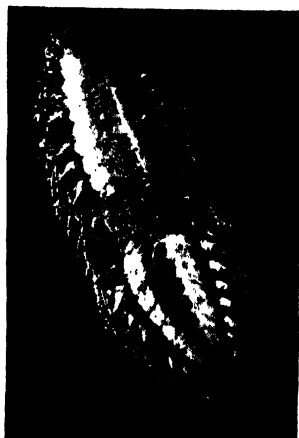
**Leeches.**—These animals are at once distinguished from the Bristle Worms by the absence of bristles or any other appendages which replace them. They have, however, a sucking disc at the end of the body, and occasionally at the front as well.

Leeches are well known by reason of their habit of blood-sucking, and whilst our own British species are restricted to fresh and salt water, in foreign countries there are terrestrial forms, which cause the traveller much uneasiness.

The Marine Leeches have cylindrical bodies, and a sucker at each end. As might be assumed, these are parasitic animals, and I have often caught diseased fish upon which



FIVE-FINGER STARFISHES



INNER SIDE OF SEA MOUSE



DOGAN SHELLS AND STARFISHES



OUTER SIDE OF SEA MOUSE



a number of the so-called Horse Leeches have been attached. In some of our ponds and rivers these Fresh-Water Leeches seem much commoner than others, and appear to thrive much better.

#### Group VI.—PLATYHELMINTHES

**Flat Worms.**—We are getting low down in the scale of animal life now, and in the great tree that we mapped out in our introductory chapter we are just clambering among the outermost branches. We shall proceed a little farther, and then fall off from our stronghold altogether. We are almost on the threshold now.

The Flat Worms are noteworthy because of their habit of dwelling inside various creatures, and in this connection we can only mention by name the Tape Worms and Liver Flukes.

#### Group VII.—CŒLENTERATA

This group of animals at once introduces us to some very low forms of life, including as it does the Sea Anemones, Corals, and Jellyfishes. We will take them in the order named, selecting two or three representatives of each.

Mr. Saville Kent, to whose excellent descriptions of a number of the animals included in this chapter we are greatly indebted, he having made a special study of the same, writes thus with regard to the Anemones: "As typified by an ordinary Sea Anemone, the body may be described as a simple sac, the orifice of which is inverted for some little distance, and held in position with relation to the outer wall by a series of radiating partitions. One or more rows of tentacles, varying in number and character according to the species, surround the mouth of this partially inverted sac. There is no distinct intestinal tract, the whole space enclosed within the outer wall, and ramifying among the radiating partitions containing the digestive juices. The radiating membranous partitions develop upon their surfaces the reproductive elements, and in the case of Corals, *which are merely skeleton-producing Sea Anemones*, partly secrete within them the symmetrical radiating calcareous plates so characteristic of the group."

**Strawberry Anemone.**—Although there are over thirty different kinds of British Sea Anemones, we can do no more than mention two of the commoner kinds. The Strawberry species should be sought for among the rocks when the tide is well out. It varies in colour, green, brown, crimson, red, and yellow being among the colours this wonderful animal assumes. When expanded, the remarkable creature may strike one as of flower-like structure, and the tyro may be pardoned by supposing it a vegetable, and not an animal. This particular species is very beautiful, and when expanded with "the circlet of turquoise beads, regarded as rudimentary eyes, developed around the outer margin of the tentacles," a charm is added which is only exceeded by few other kinds.

The young seashore naturalist would do well to study these Sea Anemones with intelligence. He should see them with the tentacles both expanded and retracted, and, if he is kindly disposed, he might do worse than feed the creatures! Procure a shellfish of some kind; cut its soft body into small portions; then find an Anemone with tentacles broadly extended, ready to catch any food that comes within reach; place the succulent tit-bit well within the central orifice of the Anemone's body, and wait events.

If your experience be similar to mine, the creature will draw in his tentacles and partake of the feast. It is all very wonderful, because of the animal's flower-like structure and appearance, its being firmly riveted to a rock, and its general remarkable life-history. After a time, the feast over, the Anemone retracts its tentacles, the remnant of the little piece of shellfish is thrown out, and the animal is ready for another feed. The juice from the food supplied has been extracted, and the dry, unsucculent portion refused.

The fine invigorating sea air, murmur of the waves, cry of sea birds, and delightful surroundings, make Anemone hunting and watching a great pleasure and the means of much intellectual enjoyment.

**Dahlia Anemone.**—Some kinds of Anemones are very crafty folk, too, for they contrive to hide their bodies in a wonderful way, and one large species with which I am

acquainted covers itself over with stones, pieces of shell, etc., so as to look like a little heap of *débris*. The *Dahlia Anemone* is our largest British species, and when fully expanded measures 6 or 8 inches in diameter. This is, however, small when compared with those found elsewhere; for Mr. Kent records specimens on the Australian coast measuring from 18 inches to 2 feet across their expanded discs. In these giant species, it appears, numerous fishes, Crabs, and other marine folk find safe refuge, and hide among the tentacles "like birds in a leafy bower." Anemones and Corals both have stinging cells, and with these they are able to benumb the living organisms upon which they feed.

Most Sea Anemones are solitary in disposition, but there are some kinds "which form aggregations or colony stocks of numerous units. These compound growths are brought about by repeated budding, or the subdivision or fission, without complete separation, of an originally single individual. It is by a similar process of recurrent subdivision that the wonderful fabrications of the Coral polyps are built up."

**Corals.**—A short description of what constitutes a Coral has already been given, but it should be emphasised that this animal only differs from a Sea Anemone in having "a calcareous skeleton secreted within its basal tissues, including portions of the membranous radiating partitions. Some Coral animals, like the majority of the Anemones, are solitary, and form single attached or loosely-lying Corals. . . . The huge Coral masses, commonly known as 'Madrepores,' out of which Coral islands and reefs are constructed, all commence as a single Coral animal, with its contained skeleton analogous to the Mushroom Coral, though in all instances much smaller. The buds developed by the Coral polyp in these instances remain attached to the parent. If they spread out laterally, they build up by accumulation the large flattened or sub-spherical masses known as Brain Corals and Star Corals, which are most abundant on coastline reefs, or from the bases of the outer barrier reefs. Where, on the other hand, the budding is terminal or oblique, branching tree-like growths, such as, the Stag's Horn Corals, with their innumerable allies

and variations, are produced. The colours of the Coral polyps are as brilliant and diverse as those of ordinary Sea Anemones, living reefs, whereon a number of different species are in a condition of healthy growth, yielding a spectacular effect that vies with that of any floral parterre. Sometimes large areas, acres upon acres in extent, may be covered with one almost uniform purple, green, brown, or other coloured growth of the branching Stag's Horn species. The aspect presented is not unlike that of a Heath-covered common."

Thus writes the late Mr. Saville Kent, who had such exceptional facilities for studying these animals on the great Barrier Reef of Australia. There are other kinds of Corals besides those mentioned, such as the Flexible Corals, or Sea Fans, and the Coral of Commerce. This latter, it is interesting to observe, has "the solid brilliantly-coloured skeleton, so much prized as an article of jewellery, deposited as a supplementary basis outside the tissues, by which the star-patterned skeletons of the stony Corals are secreted."

**Hydroid Polyps.**—Another group of animals come in here, known as the Hydroid Polyps. Most of the Jellyfishes are included among these, as well as some animals who secrete Coral, and others. The Common Hydra, or Fresh-Water Polyp, is worthy of mention as a good representative of this group. It has been compared to a very small Sea Anemone, and bears, when extended, a thin foot-stalk, and long, slender tentacles. In a similar way to the Anemone, when disturbed, it retracts its tentacles, and shrinks into a small roundish mass of jelly-like substance. A careful and painstaking study of this animal would result in many interesting details being forthcoming, but it should be mentioned, before we pass on to the Jellyfishes, that the Common Fresh-Water Hydra is well known because of the circumstance that, if one be cut up into small pieces, each portion has the power of undergoing self-repair, and growing into a new Polyp.

**Squirrel's Tail.**—Of the very considerable number of Zoophytes which resemble Seaweed in outward appearance, this is one of the chief, being classed under the general name of Coralline—*i.e.*, resembling Coral in its branching character.

Though often mistaken for Seaweeds, they are nothing of the kind.

*S. argentea* is one of the commonest of the species, and grows on shells in deep water. After a storm it may be found adhering to the empty valves of shells which are cast up on the beach. Its branches are rigid and erect. About twenty species grow around the coasts of the British Isles.

The horny skeleton is all that is left when cast on the shore and dried. Its duty is to carry the fleshy part of the Coralline, which grows in the form of a number of little cups. In these live the animals proper, under the name of *Polyps*. They are soft, and are provided with delicate tentacles, with which to seize their prey. The nutriment thus obtained serves to support the inner organisation.

These curious compound animals are sometimes called *Hy-dro-zo'-a* (Greek *hudor* = water, and *zoon* = a living animal), and are very similar to the little Hydrazes of the fresh-water ponds.

The little animals living in the cups planted on the joints or projections of the weed have the duty of providing food for the whole colony. New creatures grow from a peculiar set of bodies, which appear, as it were, to ripen and then detach themselves, leading an entirely separate existence, and resembling Jellyfish. Finally, these settle down and grow until they present a plant-like appearance.

A common name for this Zoophyte is Sea Fir, because the branches are not unlike a branch of the Fir-tree.

The scientific name is from the Latin *serta* = leaves, or garlands, or clusters of little flowers; and *argentea* = silvery, referring to the silver-like appearance of the cups when growing.

**Jellyfishes.** — As has been already mentioned, a large number of these animals are included among the Hydroid Polyps, the majority of Jellyfishes being, as a matter of fact, transitional phases only of the fixed Hydroid Polyps. If the young naturalist wishes to have his mind filled full of gratitude and wonder, he need go no farther than the animals we are now considering. Few persons except those who study them are



aware of the wonders revealed by the Medusas, the general impression as to Jellyfishes being that they are fairly large, and often very large, animals, who become stranded upon the shore after certain winds or storms, and about whose life and structure we know very little. The remarkable form and habits of the smaller members of the Medusa, however, are so absorbing and wonderful that a good deal of attention has been paid to them ; but it is safe to assert, I venture to state, that we have yet to learn more concerning them than we have learned heretofore.

It is not possible here to set out in the merest detail the many wonders associated with these Jellyfishes and their allies, many of them appearing like opalescent bells and other forms too numerous to mention. Their mode of life ; their method of division and breaking up ; the tree-like growths of some kinds, and the Medusa-like buds which eventually become detached from the "tree," and swim away ; their glass-like transparency ; and other characteristics, can only be briefly stated.

**Stinging Jellyfish.**—The Stinging Jellyfish I have found commonly on various parts of our coast. This species attains a large size, and I have found it measuring 3 feet 6 inches across. It is brownish in colour, and has long yellow threads suspended from the body, with which the creature can sting severely. When seen lying flat upon the ground, like a jelly pancake, one would hardly credit this animal with committing any harm. One sees it at a disadvantage then, for, when swimming, the umbrella-shaped body is spread and contracted. To see a shoal of these large Jellyfishes swimming about together is a vastly entertaining sight, and one the young naturalist should endeavour to see, if at all possible. In the seas surrounding our own island these curious animals are often found in large numbers.

By means of the threads upon the body food is secured. With these appendages the Jellyfish goes a-fishing. The food consists of the fry of fishes, young Prawns, Shrimps, and other marine creatures. The "sting" serves the purpose of paralysing the prey of this animal, and it soon dies. These wonderful

threads have hundreds of small oval cells, and each of these is provided with a very slender dart, which has a barbed tip. This is coiled up like a watch-spring inside it. When the cells are touched they fly open, and the little darts come out, with the result that, if any marine creature finds itself against the threads of the Jellyfish, the darts are at once thrust out and buried in its victim's body. This is not all, for the darts are poisoned, and in this way the Jellyfish procures its living.

The animals included in this remarkable group are treated of at some length in my "Story of the Sea and Seashore," but to appreciate their life and structure to the full an acquaintance should be made with living specimens.

#### Group VIII.—PORIFERA

**Sponges.**—The Sponges or Porifera are animals of quite unique structure, which derive their Latin name from the fact that the body is covered with numerous small openings or pores. These lead into a system of canals which permeate the body of the animal and then open to the exterior by one or a few larger openings. There are many varieties of Sponges, differing greatly in external form and in the structure of the skeleton. The group of Sponges which is useful to mankind is the one in which the skeleton is formed of a horny substance called *Spongin*, without the hard calcareous or siliceous structures which are present in other Orders.

They are all animals, made up of a large number of cells, and a Sponge is really a skeleton or framework of a somewhat horny character, covered with a soft fleshy form of protoplasm. The whole appears, when taken out of the water, to be a jelly-like substance, which is very sticky. This fleshy part is made of little masses of sarcoids, and of course has to be removed from the Sponge, as we know it in the shops, before we can use it.

In addition to the fibrous and horny material forming the skeleton or substance of the Sponge, there may be a number of small spicules of silica formed in the masses of sarcoid, that grow into many curious shapes, as pins, crosses, anchors, hooks, etc.

Sponges grow by budding, some of the buds being set free to form new colonies.

For a long time Sponges were thought to be vegetables. They vary much in form, some being cup-shaped, others pear-shaped, whilst some have many branches, and they all grow at the bottom of the sea attached to rocks, to which they are fixed by a kind of foot. Some are found in deep, some in shallow water, and they are of all sizes, from that of a small egg to that of a man's head. They grow to the largest size and most plentifully in warm climates.

The Sponge gets its food from the water, which is always washing in and out of the numerous holes which are seen in an ordinary Sponge. The water finds its way into the animal through the small openings, and passes out through the larger ones, the minute creatures found in it being left behind. Most of the cells are provided with *cilia*, which, when they vibrate, produce the water currents.

The Sponges of the shops are mostly brought from Turkey and the West Indies. They are obtained by divers, who tear them off the rocks, and are then pulled up into the boat again, as soon as they have got their arms full.

Large numbers especially of what are called Grass Sponges are brought from the West Indies and Florida, but they are very coarse, and are not nearly so good as those brought from the Mediterranean.

When taken out of the water, Sponges are dark-coloured, and look almost like beef-liver. They are generally buried in the dry sand for a time, until the jelly decays away, leaving the skeleton behind. They are then put into wire-cages and washed in sea-water until they are clean. Smyrna is the chief market for Turkey Sponges, which are collected from the islands round about.

There are at least two Fresh-Water Sponges—the River Sponge, found in the Thames and most of our rivers and canals. It is the dirty, yellowish slime found on timber in the water. The other is the Pond Sponge, similar in character, but of a dark green colour, and generally found in rounded masses.

The whitish Sponges sometimes seen in shops are bleached with acid, the bright yellow ones with sulphur. They look pretty, but both these methods of treating Sponges injure them.

Sponges soon become slimy and unpleasant to the touch, as well as sour and bad-smelling, if they are not used properly. A Sponge should always be well washed out after use, and should be kept in a wire basket in a current of air. When a Sponge becomes so slimy that it is disagreeable, it should be steeped for some hours in a strong solution of soda, then squeezed and washed out in clean water, changing the water several times; it will then be as good as new. A Sponge must not be wrung—simply squeezed. Another plan is to soak the Sponge for a few hours in strong salt and water, and then wash and dry in the open air.

The name Sponge is from the Greek *spongos*, which we get through the Latin, and then from the French.

#### Group IX.—PROTOZOA

We have now reached the last stage on our journey through the world of British animal life. The *Protozoa*, or *Animalcules*, represent the simplest and lowest forms of living animals. They are minute creatures, and can only be studied through the microscope. Although so exceedingly small, the structure and functions are most wonderful to comprehend; but these must be observed at first-hand to be understood and appreciated. It is not possible within the limits of this popular book to dilate upon these at any length, and the group is simply included here to complete the great chain of animal life, from Mammals to Animalcules, that we have endeavoured to construct. The various kind of Animalcules known by that name, the *Foraminifera* and the *Radiolarians*, are all worthy of close study.

Thus, having surveyed the salient features of the commoner forms of animal life found in our own land and seas, commencing with the highest animals of all, the Mammals, and concluding with the lowest—mere specks of jelly, as it were—we take leave of the reader, and hope that what has

been written may prove of service, and lead him to become an ardent young naturalist on his own account. It is only as a result of close personal companionship with Nature that her secrets can be penetrated and revealed to their fullest extent, and to that end the attention of every intelligent boy and girl who reads this book is cordially invited.



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